WORLD PETROLEUM

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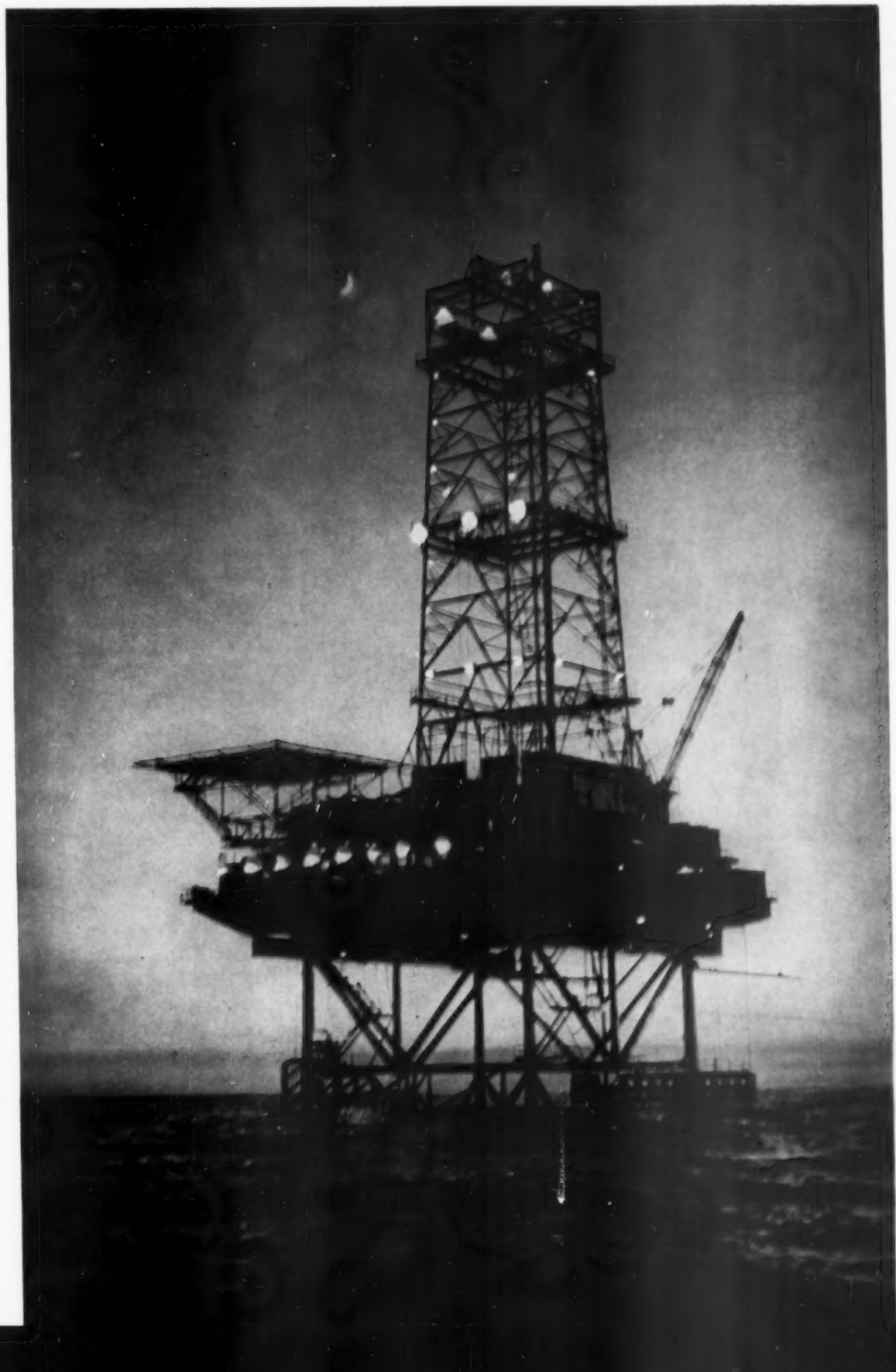
SEPTEMBER 1959



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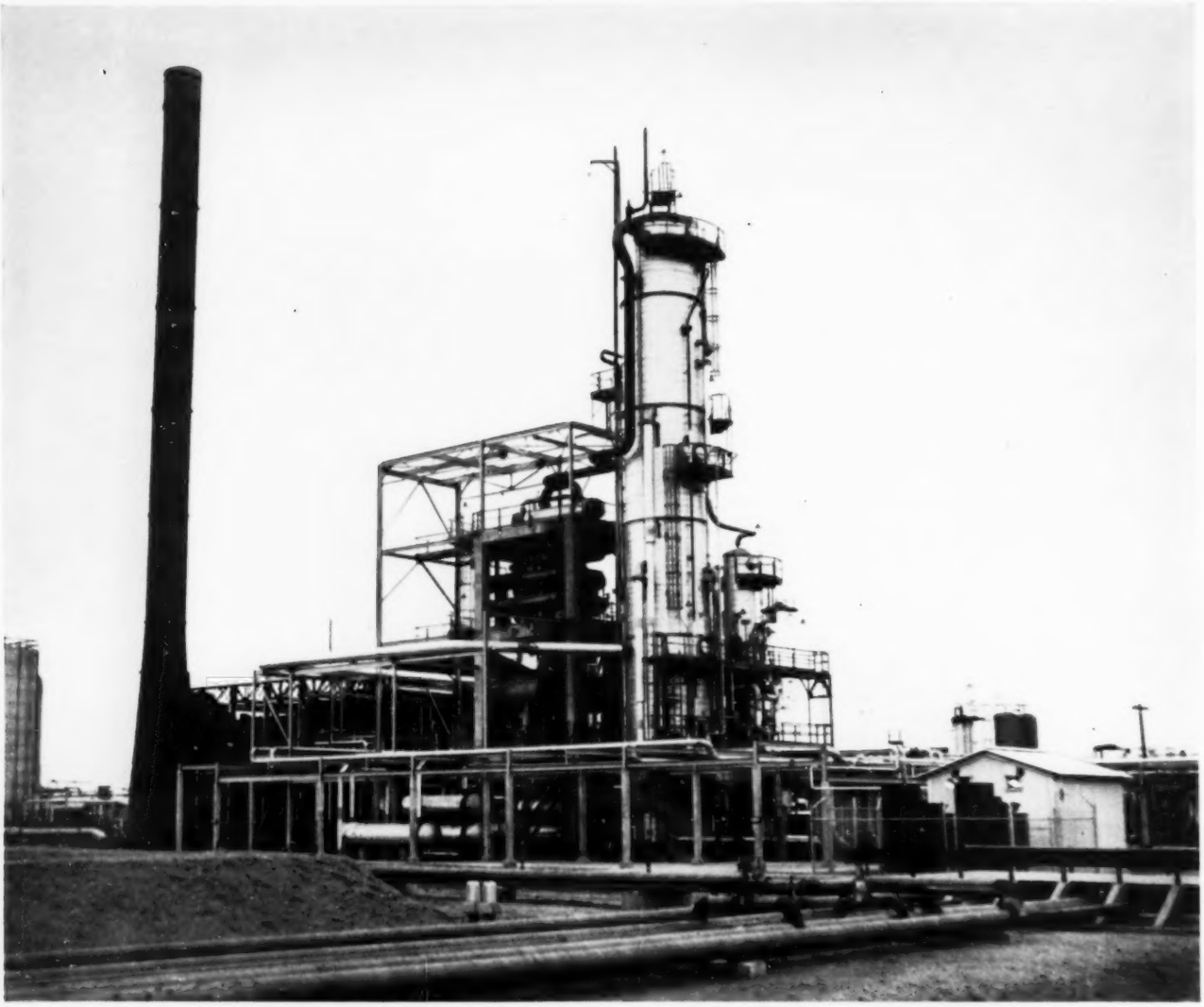

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FOUNDED BY RUSSELL PALMER

Publisher MONA PALMER
Editor J. C. CHATFIELD
Managing Editor G. H. BARROWS
Processing Editor WILLIAM C. UHL
European Editor CECIL W. WOOD
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Art Director CHARLOTTE BLASS

Member of National Business Publications, Inc., and Business Publications Audit of Circulation, Inc.

SUBSCRIPTIONS

1 year, $10.00 2 years, $18.00
3 years, $25.00 Single copies $1.00

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World Petroleum is published by Mona Palmer, Trustee under the will of Russell Palmer
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VOL. 30, NO. 10, SEPTEMBER, 1959

World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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THIS MONTH'S COVER

Two miles off the California shore at Summerland is this outsize rig, the platform for which was towed 210 miles from San Diego on empty caissons. At the drill site the caissons were flooded and jetted into the soft sandy bottom of the Pacific to a stable hardpan. The 100 sq ft deck is 50 ft above water level. Vertical extent of the rig from caissons to crown block is 340 ft. The sunset photograph showing a new moon was snapped by Ted Castle of San Francisco for the Standard Oil Co. of California *Bulletin* and is reproduced through the courtesy of C. R. Lyman, editor. The 5,500-acre lease on which the rig was located is a joint operation of Humble Oil & Refining Co. and Standard of California.

Washington PIPE LINE

by Joseph B. Huttlinger

Gasoline Tax Defeated

With President Eisenhower urging a gasoline tax increase of 1.5 cents a gallon, on top of present tax of three cents, oil men turned up in protest at hearings before the House Ways and Means committee. They suggested the tax, on top of state taxes of up to seven cents a gallon, can reach the point of "diminishing returns." As evidence of this, they pointed to the coming of the small car.

As a result, the committee voted down proposals to hike the gasoline tax. It recommended instead that Congress authorize a five-year revenue bond of up to $1 billion, and earmark 20% of the excise taxes on automobiles, or $250 million a year, to the highway trust fund. The committee said this would pay the bills if there were a slowdown in highway construction over the next few years, and a four year extension of time to complete the program to 1976. Final outcome is yet to be seen.

Import Quotas Unused

During the first oil import quota period, 2% of the import quotas were not used by companies. Out of a total of 1,472,344 b/d of import quotas in the second quarter of this year, actual imports were only 1,441,509 b/d. Thus, some 30,835 b/d of authorized imports did not come in.

Caminol Co. of Hanford, Calif., for example, authorized to import 2,200 b/d of crude and unfinished oils, brought in no oil. U.S. officials have no plans of parceling out the unused quotas to other importers—at least at the present. Largest single item of unused quotas were in residual oil to districts one through four, of 11,758 b/d, out of total allowed of 343,347 b/d. Next largest was 6,252 b/d of crude and unfinished oils to districts one through four, out of total quotas of 757,121 b/d.

Canadian Import Exemption Urged

Canada, which has won an exemption for her crude oil from the U.S. oil import program, now is seeking removal of the U.S. import duty of 10.5 cents a barrel. Canadian officials urged this during talks with a group of U.S. Senate and House of Representative members in Montreal and Ottawa June 25 through June 28.

The U.S. legislators saw little chance of action to remove the duty, which applies to crude oil from whatever its source. They did assure the Canadians, however, that they saw nothing in sight to remove the exemption of Canadian oil from the import program. They called the exemption "an important precedent."

Canadian officials told the U.S. legislators they hoped for steps to speed up government actions on proposals to import Canadian gas to the U.S. One suggestion they made was that the U.S. Federal Power Commission be authorized to admit as evidence material which is submitted to and accepted by the Canadian Energy Board.

FPC Scolds Trans-Canada

In an unusual action, Chairman Jerome Kuykendall of the U.S. Federal Power Commission has scolded Trans-Canada Pipe Lines, Ltd. for "recalcitrance or dereliction" in regard to proposals before the FPC looking toward bringing of Canadian gas to the U.S. Midwest. Mr. Kuykendall said a plan of Northern Natural Gas Co. of Omaha to bring in 100,000 mfc daily from Trans-Canada failed "due to cancellation of the sales contract made by Trans-Canada." Then, he said, Midwestern Gas Transmission Co. signed a contract with Trans-Canada to buy 204,000 mcf daily and this proposal failed when Midwestern was unable to show it could obtain the necessary gas from Trans-Canada. In view of this record, he added, "it is incumbent" upon Midwestern in the current matter to show by affirmative evidence "at least a reasonable prospect" of being able to obtain the necessary gas.

Mr. Kuykendall was commenting on a proposal by Midwestern to bring in 204,000 mcf daily from Trans-Canada through a pipeline of 504 miles to be constructed from Emerson, Manitoba, to Marshfield, Wisc. The facilities would cost $52,297,000. Michigan Wisconsin Pipe Line Co. would buy the 158,000 mcf of the gas from Midwestern at Marshfield and build 473 miles of pipeline and other facilities at a cost of $24,177,000 to distribute the gas.

Conservation Investigation Continues

The approval by Congress, both Senate and House, of the "Interstate Compact to Conserve Oil and Gas" means that the U.S. Department of Justice will still continue to make annual reports on operations of the Interstate Oil Compact for at least another four years. The action of Congress in extending its approval of the Compact for another four years, continues to require the annual reports from the DJ.

The DJ is asked to report whether the Compact has stuck to its avowed purpose of limiting production of oil and gas to prevent waste, and not for the purpose of "stabilizing or fixing the price" of oil and gas. So far, the DJ has made three reports, each of which has given the Compact a clean bill of health. The fourth report is due in September.

The reports have covered broader territory than whether the Compact has stuck to its avowed purposes. Thus, the third one hinted that the DJ might like to see oil refiners forbidden to own and operate crude oil pipelines. In the hands of a Department of Justice that is unfriendly to oil and gas, the requirement of annual reports could be dangerous to oil and gas producers. Oil men are aware that a new president is to be elected in 1960, and the Attorney General he appoints will be responsible for three of the reports during the latest extension of the Compact.

Appeals On Oil Quotas

Despite being rebuffed in the first round of appeals from oil import quotas, oil importing companies are trying again in a series of new appeals filed with the Oil Import Appeals Board.

A total of 21 oil importers have filed formal appeals from quotas issued for the second period, the last half of this year. All told, they seek an extra 300,000 barrels daily of crude and residual oil imports.

A total of 81 appeals were filed after issuance of import quotas for the first period, the second quarter of this year. They sought extra imports of more than 400,000 b/d. Unless the board changes its tough policy, most of the new appeals stand to be rejected as were most of the first round of appeals. In completing action on the first round of appeals, the board allowed in an extra volume of only 12,947 b/d. This is regarded as almost a complete rejection of the appeals filed.

The powers of the appeals board are limited. While it can grant an allocation to import crude or unfinished oils to a person with a history of importing who is not otherwise eligible, it cannot grant an allocation for product imports to a person not otherwise eligible. The board also has powers to revise upward an allocation which has been granted for crude or products.

In carrying out its work, the appeals board has ducked behind its regulations time after time to refuse relief to oil importers; in contrast, some government bodies have tended to stretch their authority beyond what is allowed by its charter of authority.

Companies filing new appeals include some of the largest of the importers. They include Gulf Oil Corp., seeking to bring in 35,000 b/d of residual oil when allowed only 2,141 b/d; Tidewater Oil Co., seeking 62,000 b/d of crude into districts one through four against a quota of 22,100 and 35,500 b/d into district five against a quota of 28,400; Standard Oil Co. (Ind.) seeking 70,265 b/d of crude against a quota of 32,410; Texaco, Inc., seeking 55,733 b/d of crude against a quota of 35,120 and 14,098 b/d of residual against a quota of 901; Sinclair Oil Corp., seeking 49,800 b/d of crude against a quota of 40,120 and 7,286 daily of residual against a quota of 6,969; Sun Oil Co., seeking a quota of 50,000 b/d of crude against a quota of 32,550; and Standard Oil Co. (N.J.), seeking 153,994 b/d of residual oil against a quota of 110,494.

The Oil Import Appeals Board turned down Aug. 3rd appeals of seven oil companies from oil import quotas for the second half of this year. Texaco, Inc., Gulf Oil Corp., Standard Oil Co. (N.J.), and White Fuel Corp. of Boston, Mass., had asked larger residual fuel allocations.

The board said it had no authority to "change the method of allocating finished products" and that it may not "modify allocations of finished products" since it is directed not to exceed overall ceilings set by the president's proclamation.

Patchogue Oil Terminal Corp., Brooklyn, N. Y., and Publicker Industries, Inc., Philadelphia, Penna., asked first time allocations to import residual, but were turned down on claims of the board that it "may not make an allocation" but "only modify an allocation that has been made" for finished products. The seventh appeal, by Standard Oil Co.

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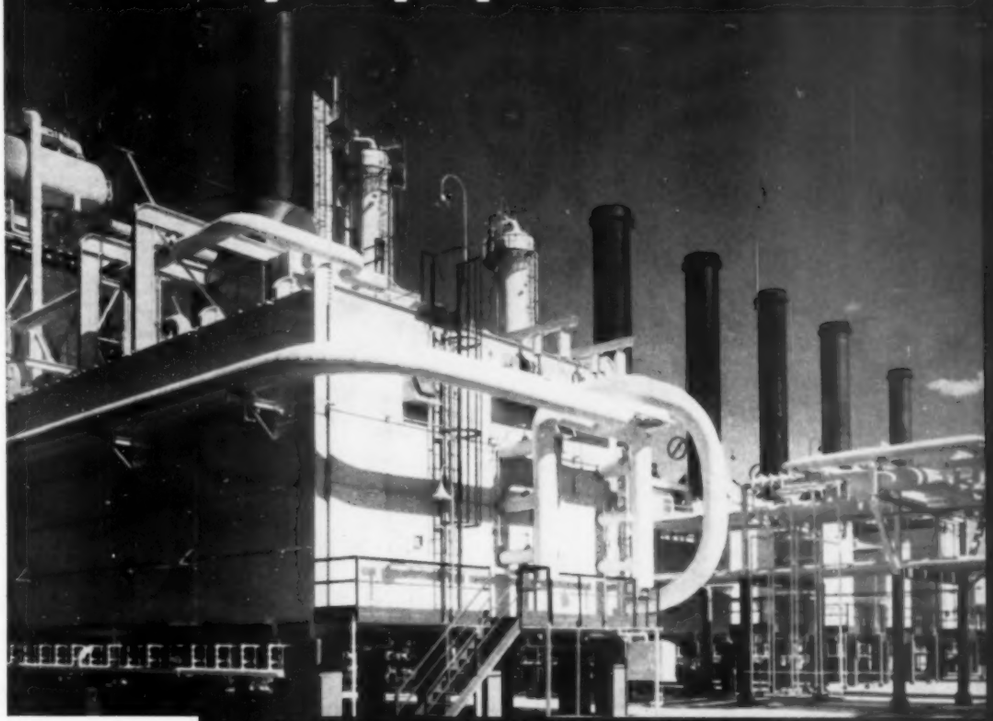

Born Heaters were selected by DX Sunray Oil Company for important heating requirements in their new West Tulsa refinery expansion.

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BORN BUILDS BETTER HEATERS BORN BUILDS BETTER HEATERS BORN BUILDS BETTER HEATERS

(Ind.), for an increase in allocation of crude and unfinished oils was dismissed by the board claiming the board "may not change the regulations of the Secretary of the Interior" on the import program.

The board said Standard of Indiana claimed the allocation is discriminatory and legally invalid and the company is urging the board to "change or disregard the regulations."

Trans-Canada Has 16 Year Gas Supply

Following a scolding by the examiner for the FPC (Federal Power Commission) for not having submitted gas reserves estimates with its latest appeal to import gas into the United States, Trans-Canada Pipelines Ltd. shortly after the close of the first stage of the hearing, filed with the FPC voluminous details about its gas supply and about the status of Canadian laws on exports.

Vernon L. Horte, manager of gas supply, said that Trans-Canada has a total of proven reserves under contract of 7.24 trillion cu. ft. He added the company is lining up more reserves in the new fields and in areas where it presently has negotiated contracts. Gladstone Stewart, Jr., vice-president of DeGolyer and MacNaughton, added that total gas reserves in the fields where Trans-Canada has contracts are 9.1 trillion cubic feet. He added that Trans-Canada can meet full requirements for at least 16 years from reserves under contract.

Assuming the Midwestern project is added as a new demand, Trans-Canada could meet the demands for 14 years. Stewart estimated that the Province of Alberta has 75 trillion cubic feet of gas in ultimate reserves with two trillion cubic feet a year being the rate of growth of the past six years, a rate which is expected to continue.

Steve Richard Sawyer, chief engineer of Trans-Canada, reviewed the $32,677,528 construction project of Trans-Canada to supply Widwestern. The work includes an Emerson, Manitoba, extension of 50.7 miles of 30-inch, two new compressor stations, four compressor station additions of 3400 hp each, about 74 miles of 34-inch loop at four points.

Paul F. Clarke, a partner in Lehman Brothers, an investment banking firm, said the company can finance the $32 million of construction. Examiner Woodall set Sept. 1 for the resumption of hearings. Then, it is expected, cross examination is to start.

Oil Equipment Exports

U.S. exports of oil field equipment are running at more than twice the dollar volume of ten years ago, according to figures from the U.S. Census Bureau. In 1949, exports totaled $76.3 million. By last year, they had climbed to $178.8 million. The trend is continuing high, as exports in the first six months of this year were $81.3 million in value.

The figures cover exports of rotary drill rigs, core drills, drill bits and reamers, parts for bits and reamers, parts for rotary drill rigs, percussion drill bits and oil and gas field equipment not elsewhere classified.

Leading destinations for the equipment have included Canada, Venezuela, Mexico, Germany and France. Exports reached a peak of $236,454,174 in value in 1957.

Here are the figures on dollar value of exports of oil field equipment in past years, from U.S. Census Bureau figures:

U.S. EXPORTS OF CERTAIN OIL & GAS EXPLORATION, DRILLING, AND PRODUCTION EQUIPMENT

1949	$ 76,272,586
1950	57,943,429
1951	88,679,845
1952	120,863,891
1953	103,683,585
1954	99,420,101
1955	129,656,494
1956	210,129,516
1957	236,454,174
1958	178,800,980
JANUARY 1959	13,607,407
FEBRUARY	12,084,586
MARCH	14,458,921
APRIL	14,025,126
MAY	11,688,892
JUNE	15,473,774
6 MONTHS-1959	81,338,706

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135,000 feet of high-pressure drilling and still good as new!

Drilling for oil is rough enough on a hose—especially when it's through some of the densest rock strata to be found. But this operator also used the relatively new air-drilling technique—an especially rugged assignment for the drilling hose he used.

What kind of super-hose did he get to do the job? He used Goodyear Style 3153 Rotary Drilling Hose—steel-cable-reinforced and factory-tested to 5,000 p.s.i. to handle the severest oil-field service.

And the result? The Goodyear hose *drilled 20 wells—135,000 feet of hole.* And a great deal of that was tough air drillings. Yet at last report, the hose was still in excellent condition.

And that's typical of the outstanding performance you can expect from all Goodyear hose—engineered for every phase of the oil-handling industry. For information, contact your nearest Goodyear Office—or write:
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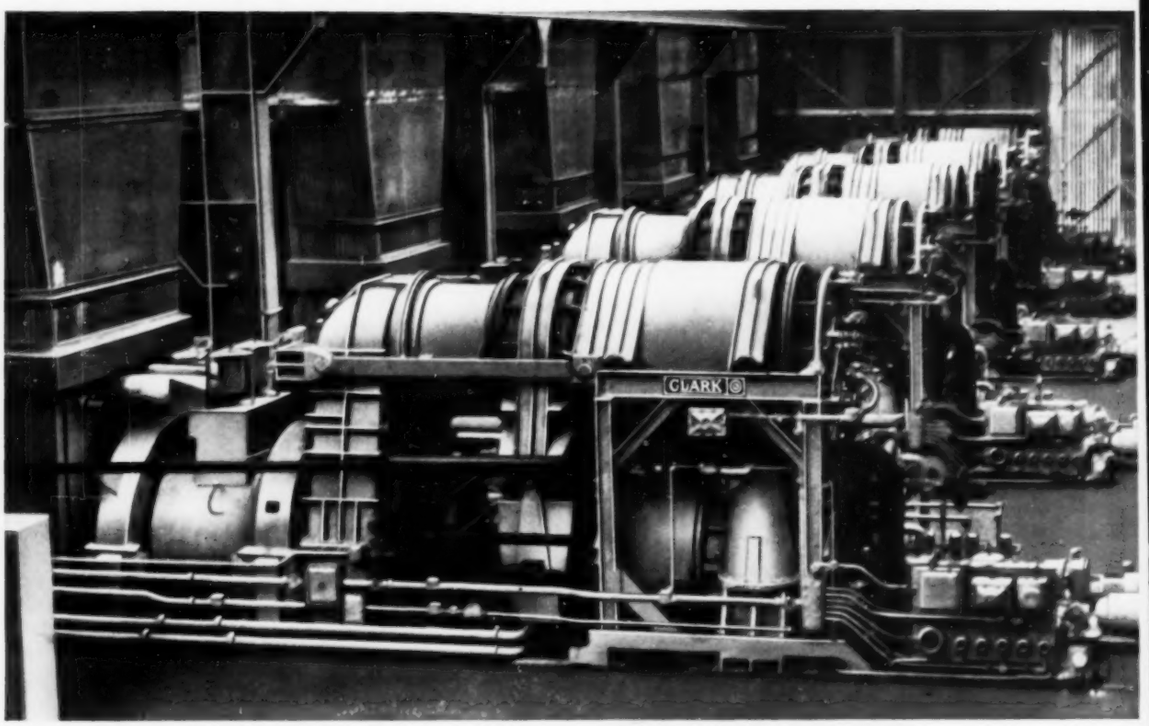
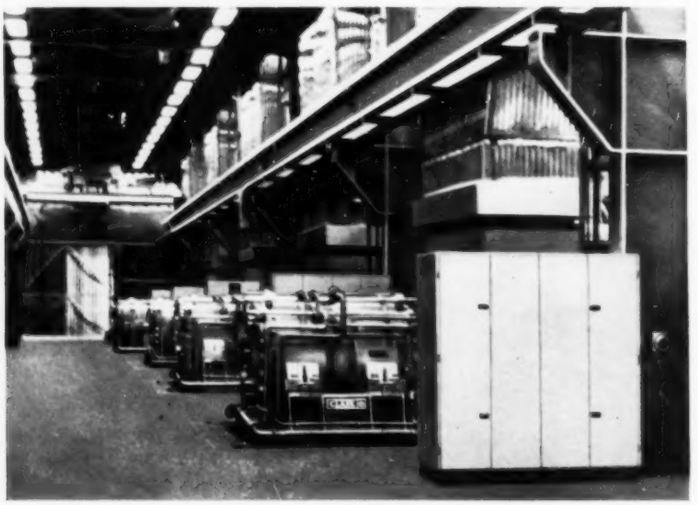


Five Clark Model 305 Gas Turbines drive Clark vertically-split centrifugal compressors operating in series. The station is highly automated with only two operators required per shift.

CLARK Gas 210,000,000



In the Arabian Desert...

At 'Ain Dar, Saudi Arabia, five Clark Model 305 Gas Turbines are driving Clark Vertically-Split Centrifugal Compressors for the gas injection program of the Arabian American Oil Company.

Surrounded on all sides by the torrid Arabian desert, the turbines and compressors are installed in a pressurized building to keep out wind driven sand. Available fuel for the turbines is sour gas while ambient temperatures soar to unusually high levels.

The 'Ain Dar injection plant draws gas from five gas-oil separator plants at a pressure of 125 psig, compressing it to 2100 psig for injection. Any four of the five series connected, turbine-driven Clark compressors can provide the necessary pressure ratio for injection. Maximum flexibility is achieved by the use of dual shaft gas turbines. An additional Model 302 turbine drives a 5600 KW generator to power the gas-oil separator plants.

Turbines Power Aramco SCFD Gas Injection Plant

Proved dependability, minimum maintenance and the low installation costs experienced by other users of Clark gas turbines were important factors in selecting the turbines and compressors for the 'Ain Dar plant.

The fact that some of the Clark turbines and compressors could be delivered from the Olean plant and the balance from Italy, was also of prime importance to Aramco.

Clark 305 and 302 gas turbines have a standard rating of 8700-9300 bhp. 1220 bhp. models are also available. Consult your Clark representative for your next gas turbine or centrifugal compressor project or write for descriptive literature.

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LONDON LETTER

By Cecil W. Wood

Tribute To 5th WPC Organizers

A very warm tribute to the American organizing committee of the recent Fifth World Petroleum Congress and the excellent results of their work was paid at an Oil Industries Club luncheon in London by M. E. Hubbard, manager of the economic relations department and a delegate to the congress from British Petroleum Co. He said the occasion—with its many receptions, official and unofficial, and its organized tours—afforded an outstandingly good opportunity for oil men of many nations to get together, "the main object of the congress, more important in many ways than the technical proceedings." It was clear, too, from the praise which Mr. Hubbard gave to the speeches of H. S. M. Burns, congress president, that these made a deep impression on all present for their aptness and humour.

Giving his personal opinions on what he felt were the weaknesses of the event from the technical aspect, he put among these the facts that, with papers only available on registration, there was no time to study them adequately, and as so many papers were read in the 10 simultaneous sessions delegates having a rather wide field of interest were often unable to attend the papers they wanted. Further, he felt discussion was rather inhibited by the necessity of waiting for consecutive translations. He regarded the discussions on the whole, as "rather poor, especially of the 'prestige' papers—a euphemism for sub-standard."

Speaking of the next congress—to be held in Germany in 1963 under the chairmanship of Sir Stephen Gibson—Mr. Hubbard expressed the hope that papers would be circulated at least six weeks before the congress opened and that the organizers would adopt the World Power Conference technique. Under this, *rapporteurs* would be appointed to summarize all the papers on a given subject, bringing out the highlights, and suggesting profitable lines of discussion. In this way the presentation of papers by authors could be eliminated, or reduced drastically, so giving more time for discussion. He also felt this technique would probably enable the number of sections to be reduced from ten to four, thereby catering more effectively to delegates with a wide range of interest. Further, as fewer language experts would be needed simultaneous rather than consecutive translation would be possible and this again would leave more time for discussion.

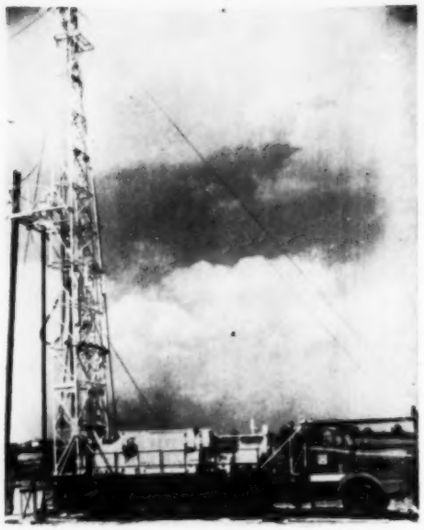
First Regular "Dracone" Service

Regular movement of petroleum products by Dracone flexible barge has started at the Esso Fawley refinery on Southampton Water and the company's distribution centers at Portsmouth and at Newport (Isle of Wight). This is the first regular service and each tow will move 10,000 gallons.

British Terratired Oilfield Vehicles

First of their kind to be made in the UK, a fleet of six high-flotation Terratired vehicles will be carrying heavy oilfield equipment next year for Shell Condor SA in Columbia territory hitherto only approachable by helicopter or special costly tracked vehicles.

These are standard Bedford 4x4 cross-country trucks modified by All Wheel Drive Ltd. to Shell designs and fitted with 5 to 15 psi 40-in. Terratires, 18-in. wide for the front and 24-in. for the rear. Ground-bearing pressure is below the 6.5 psi exerted by a man. Power steering will aid easy handling and weight is saved by bodies of light alloy materials built by Reynolds Boughton Engineering Services Ltd. Equipment includes gin poles for loading and winches with a 10,000-lb pull. In solo form the trucks can carry a 4,000-lb load in soft, marshy land or, with the special Dyson pipe trailer fitted with 48x24x28-in. Terratires, a 10,000-lb load of line pipe. By changing the Terratires for standard wheels and tires, soft ground can be traversed in dry seasons at 20mph, a speed impossible with the normal type of heavy track vehicle.



New Mobile Drilling Rig

A new mobile drilling rig—the "Pilcon 2500"—designed for drilling with 3½-in. drill pipe to 2,500 ft and developed by Piling & Construction Co. Ltd., of Croydon, Surrey, in cooperation with and to the special order of British Petroleum Co., was inspected recently in use in a BP Midland oil field. It will later be used abroad by BP Exploration Co. and is claimed to be the first all-British designed rig of this capacity and mobility to be produced.

The rig, constructed by Armstrong Whitworth (Metal Industries) Ltd., is mounted on a Thornycroft "Big Ben" truck and powered by two Dorman 6LB diesel power packs, each developing 96 bhp at 1,600 rpm, fitted with fluid couplings and air starters. The tubular steel mast, which is raised or lowered by hydraulic rams, gives 58-ft clearance over a Pilcon RT. 18 rotary table and has a capacity of 60,000 lb.

The double-drum drawworks operated through Air-Flex clutches is designed for a hook load of 35,000 lb off the main drum. The rotary table has an 18-in. opening and the mud pump is an Ideal D.50 5-in. x 10-in. Duplex. All controls are pneumatically operated and powered by Broom & Wade compressors. The rotary Pilcon Slim Swivel 25 has a capacity of 50,000 lb. Using 2⅞ in. drill pipe, the new rig is expected to be able to drill to 2,500 ft using 2⅞-in. drill pipe, and to 4,000 ft with 2⅜-in. pipe.

100,000-Ton Tanker Terminal

The enlarged Finnart terminal of British Petroleum Co. on Loch Long in Scotland—claimed to be Europe's first terminal for 100,000-ton tankers—

was inaugurated in June at a ceremony during which the 42,000-dwt "British Duchess" berthed with a cargo of crude from Kuwait. Actually it was the 1,000th tanker to berth at Finnart since the installation came into operation in 1951, during which time nearly 120 million barrels of crude have been received and pumped through the 57-mile pipeline to the BP 64,000 b/d refinery at Grangemouth.

The new jetty is about half a mile south of the original installation and is 330 ft long, built on piles ranging from 28 to 128 ft in length and driven to depths down to 25 ft, providing a low water depth of 55 ft. Considerable rock and earth excavation was necessary because of the steeply sloping loch side and provision has been made for six storage tanks, only four of which have been built at this stage, each with floating roofs. These are connected to the jetty by two 24-in. pipelines which allow a vessel to discharge up to 6,000 tons an hour and the whole operation is aided by tubular jib hose-handling gantries. Main valves are power operated by remote control and two automatic high-level alarm signals are installed on each tank to avoid the possibility of overfilling. Throughout the entire installation every possible care has been taken over three points: preservation of the natural beauty of the area and hiding it from the main road, prevention of pollution of the loch, and fire precautions. To mention but one point: special steps were taken to seal the whole of the storage area to prevent any oil seeping through underlying fissured rock. This involved surfacing all horizontal and sloping areas around the tanks with a concrete membrane constructed with special sealing joints, and all drainage water from the storage area and any possible contaminated source discharges into an oil-water separator system.

The new facilities have cost about £2 million, and in his inaugural speech the BP chairman—Sir Neville Gass, KBE, MC—paid tribute to the "excellent service" of their contractors: "Wimpeys for onshore facilities, Melville Dundas and Whitson for the jetty itself, and Rendell Palmer and Tritton the consulting engineers."

UK Consumption Up 19.7%

UK total deliveries of petroleum products into inland consumption (thus excluding deliveries to ships engaged in the foreign trade) in the first quarter of 1959 were 9,222,439 (long) tons, a rise of no less than 1,518,921 tons (19.7%) over the same period of 1958. The data is collated independently on behalf of the UK Petroleum Industry Advisory Committee and such a rise is unprecedented. All products except aviation fuels, white spirit, and paraffin wax and scale show increases. That of gas/diesel fuel oils (excluding refinery consumption) is particularly heavy at 1,112,062 tons (31.1%), with a total of 4,687,544 tons. Motor spirit, at 1,491,604 tons, shows a rise of only 96,398 tons (6.9%). The accompanying table summarises the details issued by Petroleum Information Bureau.

JANUARY TO MARCH

	1959		1958	
	Tons	*Per cent*	*Tons*	*Per cent*
Aviation fuels	311,177	3.4	384,374	5.0
Motor spirit (a)	1,491,604	16.2	1,395,206	18.1
Industrial (b) and white spirits	84,070	0.9	83,914	1.1
Kerosine	630,013	6.8	553,260	7.2
Diesel engine road fuel	518,682	5.6	488,173	6.3
Gas/diesel oil	889,480	9.7	835,039	10.8
Fuel oil (c)	4,543,646	49.3	3,320,394	43.1
Lubricating oil and grease	207,432	2.2	205,792	2.7
Other products	546,335	5.9	437,366	5.7
Total	9,222,439	100.0	7,679,161	100.0

Notes: (a) Includes motor benzole. (b) Includes industrial benzole. (c) Includes refinery consumption: 1959—745,582; 1958—579,951.

On the basis of the normal proportion represented by the first quarter's figures, the total for 1959 seems likely to be 35.5 to 37.5 million tons, against 31.1 million in 1958.

Flexible Tow

A cargo of liquid hydrocarbons has been successfully transported from the Billingham works of ICI in northeast England to Flushing in Holland and back in a "Dracone" flexible towed container of 40 tons capacity. This is the first deep-sea trial of these

A LETTER FROM SOHIO TO M. W. KELLOGG

"We are well pleased with the performance of this integrated unit. It has performed with fewer startup troubles than we had anticipated, and it has demonstrated considerably more operating flexibility than we had expected..."

(Signed) F. J. SANDERS, Engineering Manager
The Standard Oil Company [Ohio]
Cleveland, Ohio

The above is an excerpt from the letter of acceptance from The Standard Oil Company (Ohio) to The M. W. Kellogg Company for SOHIO's recently dedicated 60,000 BPSD refinery at Toledo. Kellogg is privileged to have been able to work with Dr. Sanders and the many others at SOHIO in making this highly integrated $40 million refinery an economic success. For those wishing to obtain the complete story on the project, write Kellogg for the SOHIO Kelloggram—a 20-page booklet devoted to the refinery's engineering, construction, and operation.

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containers by Dracome Developments Ltd. as the earlier shpiments, by Esso Petroleum, were only across the Solent from Fawley to the Isle of Wight.

The "Dracone" was taken on its reel to Billingham by lorry, filled through a pipe connection as it lay on the water, and towed to Flushing without difficulty under the direction of ICI's heavy organic chemicals division. The journey of 260 nautical miles was made at an average speed of 6.8 knots. The great value of this test lies in the fact that rough water, with seas up to 9 ft waves, were met, and the container is reported to have sidled over and through the wave crests with minimum fuss and with noticeable absence of yawing or snatching. Tow rope loading was far less than expected. In view of the satisfactory results, further investigations are to be carried by ICI on the transportation of various liquid chemicals.

65,000-Ton Tanker For Shell

The keel of a 65000 dwt tanker has been laid down at the Wallsend yard of Swan, Hunter & Wigham Richardson for Shell Tankers Ltd. This is the second tanker of this size laid down by these builders, representing the largest merchant ships yet to be built on the Tyne.

Birthday Honor

In Her Majesty's birthday honors, C. A. Maxwell-Lefroy, general manager of Burmah Oil Co. (Burma Trading) Ltd. and chairman of Burma Oil Co. (1954) Ltd., has been appointed a Commander of the Order of the British Empire (CBE).

Non-Ash Dispersant Aero Oil

Following flight evaluation up to full-scale airline trials in a wide variety of aircraft by major operators of several nationalities, Shell International Petroleum is now marketing in the UK a totally new oil for aircraft piston engines. Known as AeroShell Oil W, and available in two viscosity grades, this is the first non-ash dispersant additive oil to be marketed. In the US, Pratt & Whitney has granted unrestricted approval to this oil following intensive flight investigations in reciprocating engines, both large and small, and other engine manufacturers are writing specifications around it.

Some interesting research lies behind this development. An unique laboratory engine test was developed at Shell research center at Thornton (England) for accurately forecasting performance in actual flight conditions. Airline experience was secured with a wide variety of engines on seven different oils of known performance in order to get basic data for the laboratory test. Then followed over 10,000 hours testing with straight mineral oils which established that little, if any, improvement could be expected from modified refining or crude oil selections.

It was thus clear that success could not lie in the development of straight oils and a new approach was necessary. Experience in other fields suggested the development of a dispersant metallic additive for application in engines which could digest such additives. This was carried out and the subsequent flight tests confirmed the laboratory engine tests as capable of accurately predicting the service performance of advanced additive formulations as well as establishing the marked improvements in oil performance achieved by the additive approach.

Further research was necessary, however, as it was found that metallic additives have certain deleterious side effects in large poppet engines. The final step thus was to achieve the improved performance obtained with the metallic additive oil without the formation of deposits which can lead to preignition in certain types of engines. This is what has been achieved with AeroShell W, which leaves no ash residue when burned.

Orient Line's First Tanker

The first oil tanker of the Orient Steam Navigation Co.—the 37,000 dwt "Garonne"—has been launched at Vickers-Armstrong's naval yard at Waler-on-Tyne. It will cost £2,850,000 and will come into service in December on a time charter arranged with British Petroleum which is stated to give Orient a reasonable return on investment. A plan to build a second tanker was cancelled because the depression in tanker freight rates seemed likely to be of longer duration than was originally thought.

New Appointment

E. W. Berlin, deputy general managing director of Iranian Oil Exploration & Producing Co. and of Iranian Oil Refining Co., has been appointed chairman of the boards and general managing director of these companies. He succeeds K. Scholtens, who has retired at his own request. Before being appointed to the operating companies in Iran, Mr. Berlin had long experience with Standard-Vacuum both of the production side of the industry and of work in co-operation with governments.

British-Made Pipe Handler

Shell-BP Development Co. of Nigeria is now using a pipe-handling tractor made by Michigan (Great Britain) Ltd., of Camberly, Surrey, the first of its kind to be made in the UK. Powered by a supercharged Rolls Royce C4S diesel with a power train embodying a torque converter, and aided by a power-operated gear change, 4-wheel drive and power steering, this vehicle will lift a load of 14,000 lbs. of tubulars in 40-ft. lengths and move them as required. It will also load and unload a 50,000-lb. pipe-carrying trailer and tow it at speeds up to 27 mph. As the forks can be tilted forward at 70° under hydraulic control, pipe can be picked up from a point three feet below ground level—a valuable feature for barge loading or unloading. The "Michigan" 175A pipe handler can also function as a normal heavy-duty fork lift truck.

CBMPE Progress

Membership of the Council of British Manufacturers of Petroleum Equipment continues to grow, being 467 at mid-June against 453 on March 31, according to the report of the chairman, G. H. Thorne, on the council's work for 1958-59. In this he refers to the new ground broken most satisfactorily by members in the formation of Brefcon Ltd. as a consortium to deal with a Petroleo Braziliero contract, and expresses satisfaction that the work for the Duque de Caixas refinery has been successfully brought to the UK. Mr. Thorne regards the formation of British Oil Equipment Credits Ltd. (BOEC) as meeting a long-felt want in providing an entity which can act as the necessary bridge between the user overseas requiring deferred terms and the supplier of material and equipment, while allowing for freedom of operation on both sides. By the terms of the financing agreement between BOEC and Pemex, whereby £3½ million worth of equipment will be purchased in the UK for a Platformer at the Minatitlan refinery, he states that suppliers listed in the council's *Classified List of Equipment and Services* become eligible to supply Pemex, subject to their agreeing to abide by the terms and conditions issued by BOEC. The revised 1959-60 edition of this list is now available as a section of some 100 pages in the new edition of *British Petroleum Equipment*.

British Equipment Notes

Ashmore, Benson, Pease & Co., a member of the Power-Gas group, has completed the final transfer of its fabricating and machining facilities to its new South Works at Stockton-on-Tees, thus concluding a reconstruction scheme which started several years ago. A recent visit by WORLD PETROLEUM was impressive from many aspects, notably the spaciousness of layout and modernity of equipment, and it is clear the company now has a far greater production capacity available than ever before in its long history.

The 520-ft long by 65-ft wide construction shop, with its adjoining 80-ft wide structural shop, is equipped for fabricating all types of heavy industrial plant (normally up to 100 tons weight) and especially for pressure vessels to all design codes. Among the many heavy capacity units seen in the 400-ft long by 100-ft wide machine shop were two that had only recently been brought into use: a Berthiez borer with a 21-ft swing by 11-ft which takes work up to 60 tons, and a Butler bridge planer on which work 35-ft by 8-ft by 10-ft up to 100 tons can be accommodated. The visit disclosed a wide variety of work in progress for the petroleum and chemical industries, and among these was a 14-ft 6-in.-12-ft 6 in. by 158-ft 9-in. tower for a UK oil refinery being fabricated from a variety of metals, including 13% chrome-clad steel, Col-clad and Monel-clad steel.

Three "diesel savings nomograms" are available from Perkins Engines Ltd., Peterborough, Lincs., which have been devised to demonstrate to operators of road vehicles of all types what advantages there would be in changing over from petrol to diesel engines. The three large nomograms (on one sheet) cover the calculation of (a) fuel savings per mile; (b) fuel savings per 100 km; and (c) the annual cost for various periods of years after investment, initial and annual income tax allowances based on the 1959 Finance Bill.

A synthetic gas plant by Humphreys & Glasgow Ltd. at the new Warren Springs laboratory of the Department of Scientific and Industrial Research will provide material for work aimed at perfecting the liquid phase version of the Fischer-Tropsch process for producing liquid and gaseous fuels or chemicals. The plant is designed for a maximum daily capacity of 120,000 cf/d of the type of gas which would be produced by the complete gasification of low-grade coal with oxygen and steam.

Birwelco Ltd. and its subsidiary, Brown Fintube (Great Britain) Ltd., have received a contract worth over £300,000 to supply and erect six Petro-Chem Iso Flow furnaces for the Powerformer and Hydrofiner units at Esso Nederland's new Rotterdam refinery. These will range in size from 20 to 90 mm Btu, and the Hydrofiner furnace will be of novel construction, comprising three independent coils in one shell with a total duty in excess of 55 mm Btu/hr. The two firms are also supplying six of their furnaces and tank heaters for the Rio Duque de Caxias refinery in Brazil: four of these must heat hydrocarbon vapors and hydrogen to 1,000 F and operate at pressures up to 700 psi. The furnace installed at the Esso Chemical Plant at Fawley, which has a heat release approaching 200 mm Btu/hr, is the largest heater of its kind outside the American continent.

Woodfield Rochester Ltd., of Rochester (Kent), announces that its first Ideco-Woodfield 98-ft Junior Full-View Mast, built late 1958, was purchased by Kuwait Oil Co. and is now operating in Kuwait. Three 143-ft Full-View Masts have since been constructed under the Ideco license for UK oilfield equipment manufacture and shipped for operation in Iraq—one by Iraq Petroleum Co. and two in the Rumaila field by Keir & Cowdet Arrow Drilling (U.K.) Ltd. as contractors to Basrah Petroleum Co.

UK-US Equipment Links

British Industrial Gases Ltd. of Enfield, Middlesex, has concluded an agreement with Harris Calorific Co., of Ohio, whereby the latest American designs in oxy-fuel gas cutting equipment will be made in Britain. The agreement allows BIG to export the equipment to all countries except Australia, Canada, and South Africa.

Imperial Chemical Industries Ltd. and Engelhard Industries Inc., of New Jersey, have signed an agreement covering the production and sale by the U.S. company of platinum-titanium electrodes using techniques developed by ICI metals division. These have been proved to have a wide range of valuable uses, including the cathodic protection of industrial plants and ships' hulls.

G. & J. Weir Ltd. and Chicago Bridge & Iron Co. have formed Weir-Chicago Bridge, Inc. as a jointly owned U.S. subsidiary to design, fabricate, and erect saline water conversion plants. This partnership will make Weir's unrivalled experience of large sea water evaporators available to U.S. water authorities in combination with Chicago Bridge's great production and erection resources.

New Appointments

J. C. G. BOOT and A.S.C. HULTON have been appointed directors of Shell International Co. Ltd., and W. F. MITCHELL a director of Shell International Chemical Co. Ltd. and of Bataafse Internationale Chemie Mij.

E. C. PEET, a director of Shell Petroleum Co. since 1953, has been appointed a member of the board of Bataafse Petroleum Mij., one of the principal holding companies of the Royal Dutch/Shell group.

W. B. ABEL has been appointed chief marine engineer of Shell-Mex and B.P. to succeed J. E. WINSCOMBE, who retired June 30. Mr. Abel joined the company in April 1957 and was formerly marine superintendent of National Benzole Co.

DR. P. J. GARNER, formerly deputy laboratory manager at Shell Petroleum's research center at Cheshire, has been appointed director of research at Shell Chemical Company's Carrington research laboratory near Manchester. He succeeds V. N. LUKE, who has become head of the new Shell Chemical's plastic division in London.

R. E. FLEMING has been appointed a director of Burmah Oil Co. to succeed W. A. Gray, who has retired.

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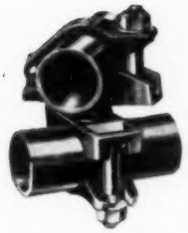

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KONTOL* *Corrosion Inhibitor*

Organic corrosion preventive for protection against corrosion in oil wells, pipe lines and other production equipment.

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Ashless, oil-soluble chemical compounds which improve color and residue stability of domestic heating oils and diesel fuels.

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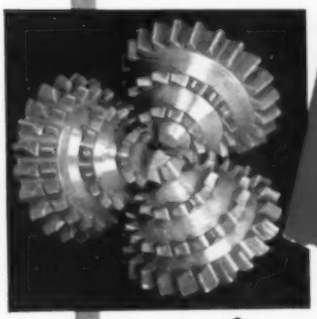

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FORMATION RATINGS: For hard semi-abrasive sand, hard lime with chert streaks, dolomite, etc.

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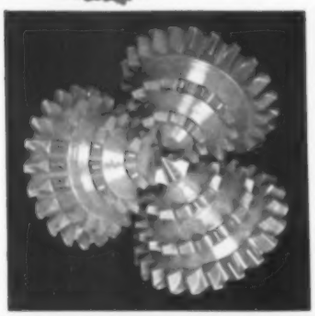

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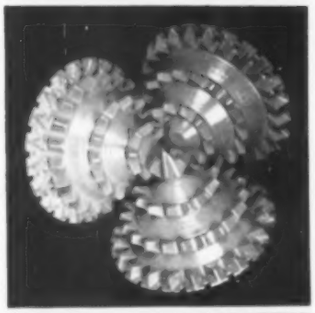

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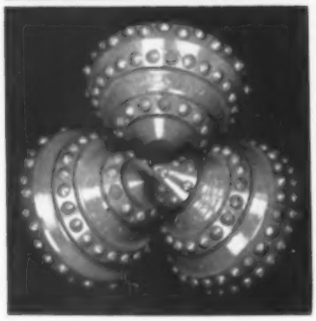

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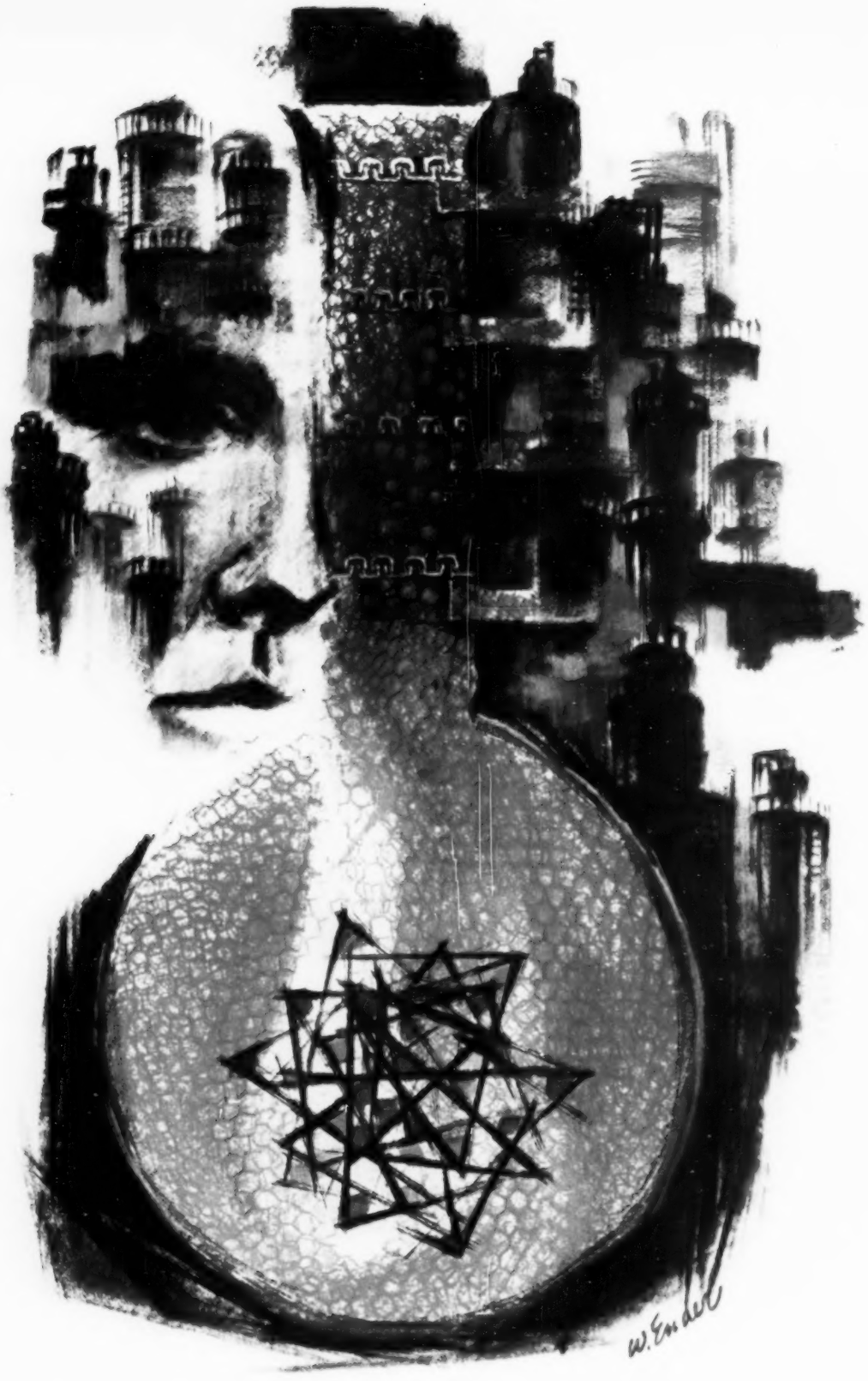
OVERSEAS...Security International C. A., Caracas, Venezuela; London, England



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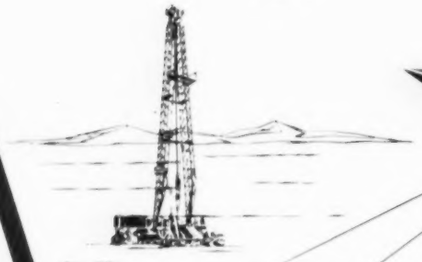

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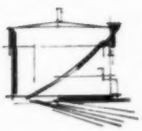

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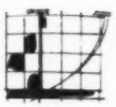

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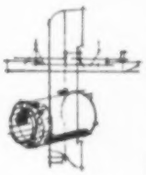

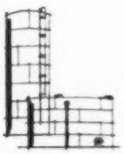

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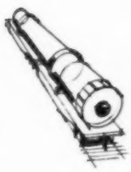

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CANADIAN NOTES

BC Gas Reserves

Proven and probable discoverable natural gas reserves in northeastern British Columbia are estimated at not less than 60 trillion cubic feet, said Dr. George S. Hume, chief geologist of Westcoast Transmission Co. Ltd., at annual meeting. He contended visible reserves are ample for all possible markets, and said the past year has been one of tremendous discoveries in this region.

Schlumberger Appointments

W. S. Jones has been appointed assistant to the vice president, Schlumberger of Canada. He was formerly area staff specialist at Calgary. He joined Schlumberger in 1948 and served at Edmonton, Stettler, Calgary and Houston Headquarters of Schlumberger Well Surveying Corp.

B. M. McVicar has been appointed general manager of sales and heads the newly-formed department which will direct sales for the Canadian company. Mr. McVicar joined Schlumberger in 1949 and served at Edmonton, Redwater, Regina and Calgary. Most recently he has been Eastern Canada Division Manager based at Regina.

L. V. Carson has been appointed Eastern Canada division manager based at Calgary. Mr. Carson will supervise operations in Manitoba, Saskatchewan and Southern Alberta. Formerly a senior sales engineer at Calgary he has served in Camrose, Calgary, Peace River, Edmonton and Regina, and joined Schlumberger in 1952.

TCPL Gas Price

Latest gas purchase contract to be signed by Trans-Canada Pipe Lines Ltd. in Alberta provides 13½ cents per Mcf base price, escalating to 21 cents in 24 years by unstated increments. Producer is Omega Natural Gas Co. Ltd., small Calgary independent with three wells at Grassy Island Lake in southeastern Alberta.

Exploration Down

Geophysical activity took sharp downturn in Western Canada for July, with only 58 crews at work compared to 84 in same month of 1958. Cumulative crew months for first seven months of 1959 were only 563, down 17% from 669 months last year and off 30% from 810 months in the same period of 1957.

Pipe Line Permit Asked

Peace River Oil Pipe Line Co. Ltd. has applied for a permit to build a 130-mile 12-inch crude oil pipeline from Windfall to Edmonton. The line would be the second stage in an integrated project in north central Alberta. Permit for the first stage, from Swan Hills to Fox Creek via Windfall, was issued previously. It is understood construction will go ahead concurrently when development and markets justify it.

New Calgary Line

Rangeland Pipe Line Co. Ltd., a subsidiary of Hudson's Bay Oil and Gas Ltd., plans to build a $3,000,000 111-mile pipeline fom the Cessord field in southeastern Alberta to Calgary. Except for six miles of 6 5/8 pipe, the line would be 8 5/8 in. OD. Initial capacity would be about 5,000 b/d. Cessford crude is about 24° API. The line serves refineries in Calgary with specialty crude for asphalt products.

BC Pipeline Permit Asked

Pacific Petoleums Ltd. has applied for a permit to build an oil gathering and delivery system in northeastern British Columbia. Pacific proposes to build a line from the Blueberry-Beatton-Milligan Creek area to Taylor Flats and Dawson Creek, B.C., refineries.

Applications were filed earlier by Gibson Associated Oils, Ltd., Trans-Prairie Pipe Lines Ltd., and Peace River Oil Pipe Line (B.C.) Ltd. All propose to deliver crude from Northeastern B.C. oil fields to refineries at Fort St. John and Dawson Creek. The Peace River Pipeline proposal also includes a link with the Trans-Mountain Pipe Line.

Placer Sale

Placer Development Ltd. of Vancouver has announced the sale of the bulk of its oil holdings to Hamer Corp. of Midland, Texas, in a $12,000,000 transaction. The announcement from Vancouver stated that the deal involved sale of all issued shares in Coronet Oil Co., a Placer subsidiary. A large amount of the funds made available by the sale may be used for development in which Placer is interested at present. Placed is interested in the Craigmont property in British Columbia's Highland Valley through its subsidiary, Canadian Exploration Ltd.

Merit Oil's New Directors

Merit Oil Ltd., has been joined by the following in the capacity of new directors: N. E. Tanner, a director of Trans-Canada Pipelines Ltd., R. H. Jenkins, Calgary businessman, and J. H. Teeter, executive director of the Damon Runyon Fund, New York. In making announcement of the new directorships, C. R. Walker, the company's Board Chairman, announced also the resignation of R. M. Ross as president and director and the resignation of Alan E. Swan as a director. Appointment of a new president has not been announced as yet.

Interprovincial Net Rises

Interprovincial Pipe Line Co.'s consolidated net income for the first six months of 1959 amounted to $8,046,292 equivalent to $1.59 per share. During the same period in 1958 the company eanred $5,605,-853 or $1.11 per share.

Approximately 60.3 million barrels of crude oil were delivered by the pipeline system during the first half of 1959 as compared to 53.1 million barrels during the corresponding period in 1958. Throughputs in terms of barrel-miles were 25 0/0 greater at 67.2 billion.

Welex Promotions

Welex of Canada Ltd. has appointed H. T. Harvey as operations manager. Management of field operations will be from a new office in Edmonton. S. H. (Stan) Nelner, former operations manager, has been named vice president for operations at Calgary.

To Assemble Jeep In Canada

The first Canadian-built "Jeep" vehicle was produced by Willys of Canada, Ltd., at its Windsor, Ont., plant in July it was announced today by W. S. Pickett, vice president in charge of sales of Willy-Overland Export Corp. First model was the CJ-5 "Jeep" Universal. The CJ-3B and CJ-6 models to be placed in production at a later date.

20,000 Wells Needed

Effective exploration for oil and gas in Alberta calls for 20,000 exploratory holes, according to a report by C. W. Jackman of the Alberta government's department of Mines and Minerals. Prepared as background information covering 75 years of oil and gas exploration and development in Alberta for the years 1883-1958, the report stated in part:

"Except for weather and terrain conditions, the only likely limiting factor on oil and gas exploration and development in Alberta for some years will be the provision of market. It will require 20,000 exploratory holes to effectively explore 200,-000 square miles of surface under which oil and gas may be found. At the end of 1959 approximately 4,500 of these holes had been drilled. Exploratory drilling has averaged over 350 completions per year from 1952 through 1958."

CPA Welcome Energy Act

S. Douglas Turner, acting general-manager of the Canadian Petroleum Association, said recently that the proclamation of Bill C-49—now known as the National Energy Board Act—is very gratifying news to the exploration and development phases of the Canadian petroleum industry. Mr. Turner said, "It is our hope that the administration of the Act will greatly assist in furthering the optimistic growth of the industry. . . ." "Although the creation of the Board does not automatically spell an end to our crude oil and natural gas marketing problems, the enunciation of a firm federal gas policy, coupled with the existing cooperation of the western provincial Oil and Gas Conservation Boards, is sincerely welcomed by the petroleum exploration and development industry in Canada."

Trans Mountain Line Picks Up

Trans Mountain Oil Pipe Line Co. deliveries for June and July show effects of the U. S. imports relaxation. The company reported from Vancouver that its deliveries of crude oil in June averaged 106,638 barrels daily as compared with 82,417 barrels daily for June of the preceding year. Scheduled deliveries for July were expected to average 114,000 barrels daily.

Sun Oil Operation At Blueberry

Fargo Oils Ltd. has announced that Sun Oil Co., which has been a participating party since January 1st, 1959, assumed the duties of operator of the Blueberry properties on July 1, 1959.

Gas Plant At Carstairs

Plans are progressing for the construction of a $3,750,000 gas processing plant in the Carstairs area by Home Oil Co. Ltd. on behalf of the Carstairs gas producers. It is to be located five miles west and two miles south of Carstairs. Construction was to start on August 15 and the plant is scheduled for completion on March 1, 1960.

It will have a capacity to process 75 million cubic feet of raw gas per day which will be drawn from the Carstairs field and sold to Trans Canada Pipe Lines. The plant will remove the acid gas content by an amine treatment and in addition to the pipeline gas will market appproximately 2,200 barrels of condensate per day.

JOHN M. PIERCE, president of Ranger Oil (Canada) Ltd. and of the Ranger Oil Co., has been elected to the board of Bralsaman Petroleums Ltd., Vancouver. He has been acting in a consulting capacity for the partnership interests of Bralsaman Petroleums and Ranger Oil in several oil and gas ventures throughout Western Canada.

DR. GREGG POLOYNIS has succeeded Philip P. Walter, Calgary, as president of Blue Crown Petroleums Ltd.

COLONEL GEORGE C. FRASER has been elected to the board of The Calgary & Edmonton Corp. Ltd. Among other posts, Colonel Fraser serves as chairman and trustee of Texas Pacific Land Trust and director of the TXL Oil Corp.

GLEN H. CURTIS has been elected vice president of Stone & Webster Canada Ltd., Montreal. He joined the company in 1955 as engineering representative.

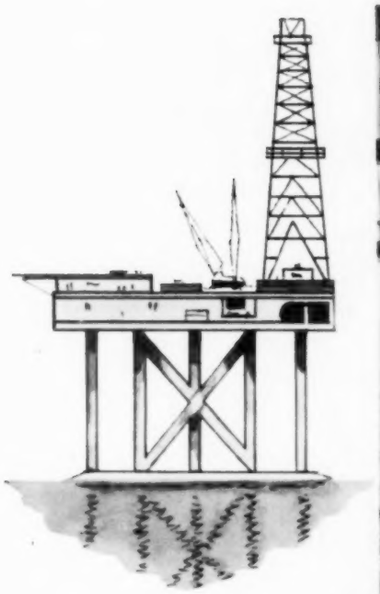
E. D. HURD has been appointed vice president of Trans-Mountain Oil Pipe Line Co., Vancouver, and its subsidiaries. Mr. Hurd served formerly with the company as administration manager.

R. W. "Bob" CAMPBELL, former general manager, production and pipelines, has been named general manager of Home Oil Co. Ltd. **J. H. HAMILTON** formerly assistant operations manager, has been promoted to assistant to the general manager. **MAURICE P. PAULSON** is named manager of production and pipelines in Mr. Campbell's stead.

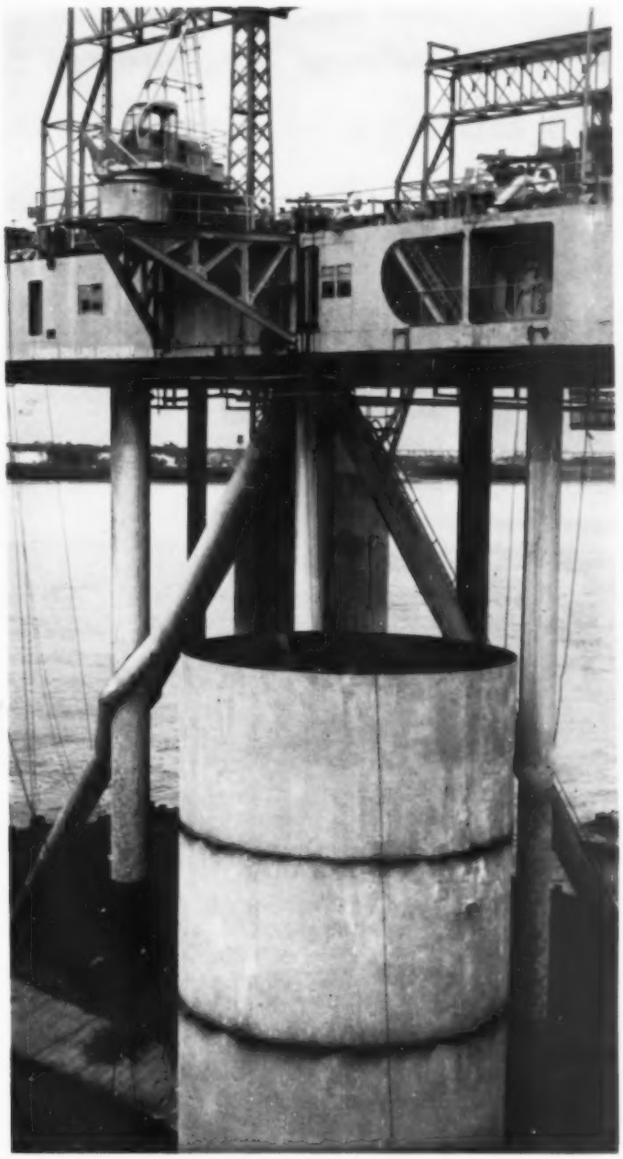
Canadian Merger

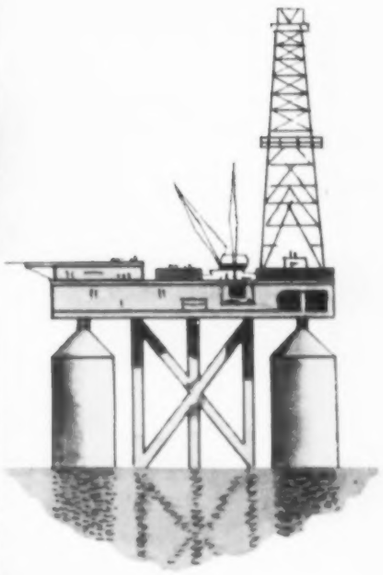
Controlling interest in New Davies Petroleum Ltd., Calgary, has been acquired by Bayhead Investments Ltd., Toronto. This investment firm also controls Southern Union Oils Ltd., Toronto. New directors to fill vacancies on board of New Davies have been associated for considerable time with Southern Union. Head office of New Davies will remain in Calgary. However, executive offices are being established in Toronto.

converted by AVONDALE in 9 weeks



from hydraulically actuated piston-type stabilizing system





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In oil company laboratories Gardner-Denver secondary recovery specialists work side by side with petroleum engineers to develop pilot plant equipment. On field tests Gardner-Denver men and equipment help work out practical applications.

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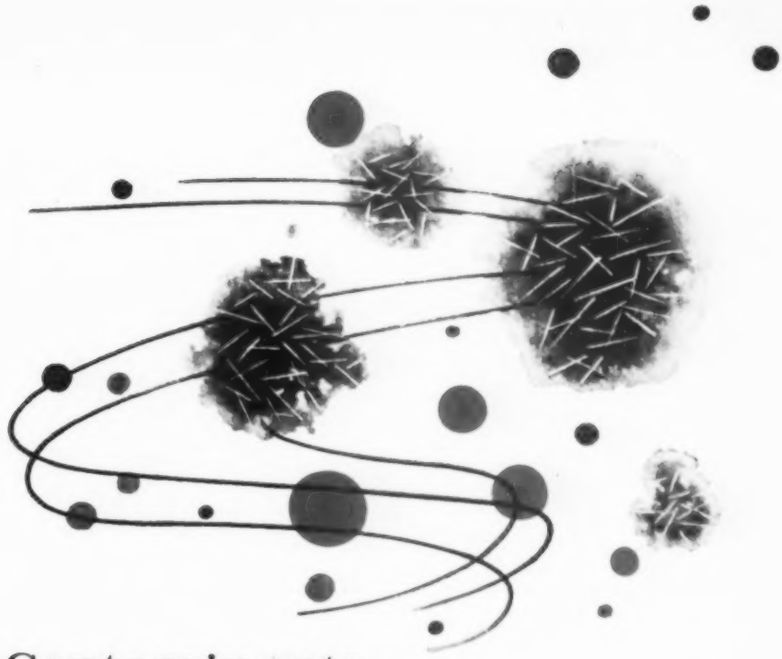

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UNION CARBIDE Mono-and Diethanolamine provide petroleum refineries and natural gas systems with excellent acid-gas absorbents. At ambient temperatures these organic bases react with the acidic contaminants in gas streams to form salts. Upon heating, the salt decomposes and the amine is regenerated. Hydrogen sulfide removed in this manner can subsequently be converted into elemental sulfur. This provides an economic continuous process for removing these undesirable materials from the gas stream.

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In some plants, monoethanolamine is used along with diethylene glycol for simultaneous desulfurization and dehydration. Besides reducing the hydrogen sulfide content, this mixture also removes water vapor which might form hydrates and block transmission lines.

Our laboratories and field testing facilities are continually engaged in extensive research activities designed to improve gas treating processes. The results of this research are readily available to the industry through our Technical Service Department. For additional information and technical data, (CWP-9) write today to the Chemicals Department, Union Carbide International Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, New York, U.S.A., Cable Address: UNICARBIDE, New York.

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LATIN AMERICAN OIL NEWS

Unitization In Venezuela

The Venezuelan government is trying to institute unitization in Venezuelan production. According to plan, a field containing several concessions belonging to different companies will be exploited by the concessionaires as one operation, with the individual companies making their own administrative arrangements among themselves.

Venezuelan Oil Discoveries

Venezuelan Sun has drilled a semi-exploratory well SVS-31 presently producing an average of 2,700 b/d on Maracaibo Lake. The well was completed as a simple producer in the Miocene through a chocker of ½". The well has a gas to oil ratio of 752 cu. ft. per barrel and a gravity of 34.3° API.

North of "La Freitera" field, Mobil Oil has completed as two-zone producer, the exploratory well Maulpa-1. On initial test the well produced 1,176 b/d through two chokes of 5/16" with an average gas to oil ratio of 3,320 cu. ft. per barrel and an average gravity of 42.8 API.

Conservation Expert In Venezuela

Mac L. Crocker of the Texas Railroad Commission has been engaged by the Ministry of Mines and Hydrocarbons to advise the Coordinating Commission for the Conservation and Commerce of Hydrocarbons, on the preparation of a proration program and the establishing of the necessary control mechanisms.

$600 Million In Venezuela

The government-owned "Banco Central" points out in its latest annual report that the investment of the oil industry in 1958 amounted to 2,065,000,000 bolivares (about U.S. $600 million), 17% greater than 1957 when the total investment only amounted to Bs 1,762,000,000.

Creole's Investment Halved In '59

Creole's Petroleum Corp., reported estimated net earnings for the first half of 1959 of $115,500,000, or $1.49 per share. This compares with earnings of $117,200,000, or $1.51 per share for the first half of 1958, including the change in the Venezuelan income tax rates. Production of crude oil for the first six months of 1959 averaged 1,181,243 b/d compared with a daily average of 1,032,072 barrels during the same period of 1958. Combined crude runs of Creole's refineries at Amuay and Caripito averaged 358,533 b/d for the first half of 1959. For the first six months of 1958 the daily average was 303,895 b/d. Capital and exploration expenditures amounted to $43,400,000 during the period, compared with $82,000,000 for the first half of 1958.

Betancourt Confident On Oil

Speaking before the local leaders of finance, President Betancourt expressed recently great confidence in the improvement of Venezuela's oil industry and the lifting of the mandatory restrictions imposed on Venezuelan oil by the United States. The president's address was in keeping with the optimistic report presented before congress by the Minister of Mines and Hydrocarbons, Dr. J. P. Perez Alfonzo. Public reaction has been somewhat sceptical towards the report and the president has been severly criticized by the local press for what they termed "an unjustified confidence in the present oil situation."

Shell Creates Cultural Foundation

The creation of a Shell Foundation with a starting budget of four million Bolivars—about $1,250,000—was one of the last official duties of retiring Shell president, G. C. K. Dunsterville. At the first meeting of the foundation directors, Dr. Carlos Mendoza was elected president and Dr. Rafael Morello, general manager. The foundation's object is the realization of scientific, social and cultural activities as well as the creation of centers for all these activities.

Franklin Enters Venezuela

Franklin Supply Co. has purchased Petroleum Industry Consultants C. A. (Peticon) from Servicios Hydrocarb, C. A., Caracas. Peticon, the pioneer petroleum equipment supplier in Venezuela, has warehouses at Maracaibo, Anaco and Barinas and an office in Caracas, with an operating staff of 40 employees. As a subsidiary of Franklin Supply Co., Denver, it will be known as Peticon Division-Franklin Supply C. A., with general office at Avenuda Los Haticos No. 122-56, Maracaibo.

Costa Rica Well Halted

Union Oil's drilling operation has been halted temporarily on Costa Rica's Caribbean coast near the port of Limon after reaching 10,500 feet in the latest effort, without success. A new test well will be spudded in shortly further south on the coastal section.

The test near Copan, Guatemala, known as Chinaja #1, has shown "highly encouraging" shows and drilling is continuing. The well is a joint effort by Union, Continental, Amerada and Ohio Oil, Ohio Oil operated. This is the first concrete evidence that oil deposits do exist in Guatemala although it is inconclusive as yet. Several other joint-venture drilling tests are being conducted in various sections of the Province of Peten by major oil companies to test structures.

3000 b/d Argentina Find

YPF in Argentina has brought in a new oil well in the Madrejones field, Salta Province, with a producing capacity of 3140 b/d of crude oil and 17,500 mcf of gas daily. The well, named M-17, has a higher capacity than any other in the country. It is 1300 feet from the Bolivan border.

Bolivian Floods

Crude oil production in Bolivia slumped to 715,788 barrels in the first quarter of this year, down 16.8% from the year earlier total of 860,919, due to two floods in December and February at Camiri, the principal producing area of YPFB, the Bolivian national petroleum entity, the only domestic producer of petroleum.

Nicaraguan Oil Concession

Occidental Petroleum Corp. of Los Angeles, recently approved for listing on the American Stock Exchange, is expanding into international oil leaseholdings in acquiring a concession to develop 800,000 acres in Nicaragua. Two exploratory wells will be drilled on the west coast of Nicaragua within 90 days by the company's subsidiary, Gene Reid Drilling, Inc.

Engineer Shortage In Venezuela

Professional practice in Venezuela is largely restricted to nationals, and recently this situation has reached out and touched the many oil engineers from other countries who work in the country. They are faced with the need for registration of their degrees with the College of Engineers. The problem is expected to solve itself, but the basic shortage of trained national engineering personnel will continue, as the accompanying table shows.

GRADUATING CAPACITY OF VENEZUELAN UNIVERSITIES

	1959	1960	1961	1962	1963
Civil Engineers	78	176	191	269	523
Geologists	8	16	29	25	84
Mining Engineers	—	1	3	28	19
Metallurgical Eng.	1	1	1	8	26
Electrical Eng.	19	27	50	84	216
Mechanical Eng.	5	7	6	36	169
Chemical Eng.	6	1	15	28	140
Petroleum Eng.	--	5	29	35	55
	117	234	324	513	1232

Venezuela evidently faces a serious shortage of engineering professionals to develop its industry. What makes the situation seem worse is the fact that local universities are not prepared to produce the needed number of professionals for at least five years according to the figures compiled.

At the present moment, there are 2824 engineers registered at the College. This figure is by far insufficient to cover the technical necessities of the country since the oil industry alone employs over 2000.

The great majority of the latter figure are not registered engineers since they graduated abroad. Some 80% of these engineers are petroleum, electrical, mechanical, chemical specialists. The Venezuelan College of Engineers has only 329 registered in these professions.

In view of the common problem, the oil companies have begun conversations with the College of Engineers on the specific applications of the professional law, hoping to arrive at some practical solution within that law. At the same time, the oil companies as well as the government are carrying on an active program of scholarships which is expected will greatly increase the number of Venezuelan professionals in the next few years.

Shell's Venezuelan Personnel Policy

In a circular letter signed by Shell of Venezuela's president, G. C. K. Dunsterville, the company has expressed the intention of becoming "as Venezuelan as possible." It is now the policy of Cia. Shell de Venezuela to employ an "ever increasing number of Venezuelan personnel in all departments and in all levels of administration of the company."

In order to carry out this policy the company has prepared to: a. Select Venezuelan employees in preference to foreign employees. b. Train and develop Venezuela personnel in order to take maximum advantage of their potential abilities. To arrive at this goal, Venezuelan personnel will be trained in Shell's installations in Venezuela as well as in other installations of the Royal Dutch Shell Group abroad. c. The company will give help to universities and other educational and technical institutions to contribute to the continuous improvement of the educational, technical and professional levels. d. Shell will give special help to outstanding or promising Venezuelan students wishing to specialize in those professions in which there is a shortage of professionals. e. Maximum utilization of foreign personnel capable of training and developing Venezuelan personnel. Shell has a program of 200 college scholarships granted to Venezuelan students.

Conservation Project In Venezuela

The Technical Conservation Division has approved a project presented by the Texas Petroleum Co. for the construction of a gas conservation plant in Campo Mata, Anzoategui State. The plant will be equipped with three compressors which will inject 14 million cubic feet of gas per day, thus helping to recover some additional 18,040,000 barrels of oil total.

Ministry Training Personnel

The Ministry of Mines and Hydrocarbons has announced the creation of a Commission for the Programming of Training for Petroleum Technicians. The new body is authorized to create subcommissions and seek information from all sources in carrying out its goal of augmenting the number of Venezuelan technicians in the petroleum industry. Commission members are: Dr. Eduardo Acosto Hermoso, director of the Technical Office of Hydrocarbons; Dr. Humberto Peñaloza, Director of Oil Economy Department; Dr. Hector Isava, Dean of Engineering at Central University; Dr. Juan Jones Parra, director of the Technical and Industrial School and Dr. Carlos Lander, a director of Creole Petroleum Corporation.

Cuban Activity Slowed

Drilling in concessions held by American oil companies is at a standstill due to current political conditions. One U. S. oil company official said that the present political situation "just about puts the last nails in the coffin insofar as drilling in Cuba is concerned." He pointed out that what test drilling that has taken place to date has been discouraging and that "most of us were about ready to throw in the sponge anyway."

A "hot" ring helps tame an old enemy

Atomic radiation helps this man do his job.

He's Dr. Hugh Macpherson, one of Standard's research engineers. The "hot" ring he's holding is an ordinary piston ring which has been exposed to atomic radiation.

By installing such radioactive piston rings in a car, our research engineers can use a Geiger counter to measure wear *as it happens* while the car is driven on the highway, in traffic, on hills — in every possible driving situation.

This research technique has taken months off the time needed to test the effectiveness of new motor oils, and it's far more accurate than previous methods.

It's one of the techniques pioneered by Standard's scientists to help defeat an old enemy—wear... to learn what it is, what causes it, how to prevent it.

Our progress has been steady. Working closely with car manufacturers, we've virtually ended the problem of wear in automobile engines.

In the 1930's, for example, cars could go only 20 to 40 thousand miles before a major overhaul. But with today's motor oils and regular oil changes, your engine can be good for more than 100,000 miles—can, in fact, outlast the car.

By such never-ending research that leads to better products, ***the people at Standard are planning ahead to serve you better.***

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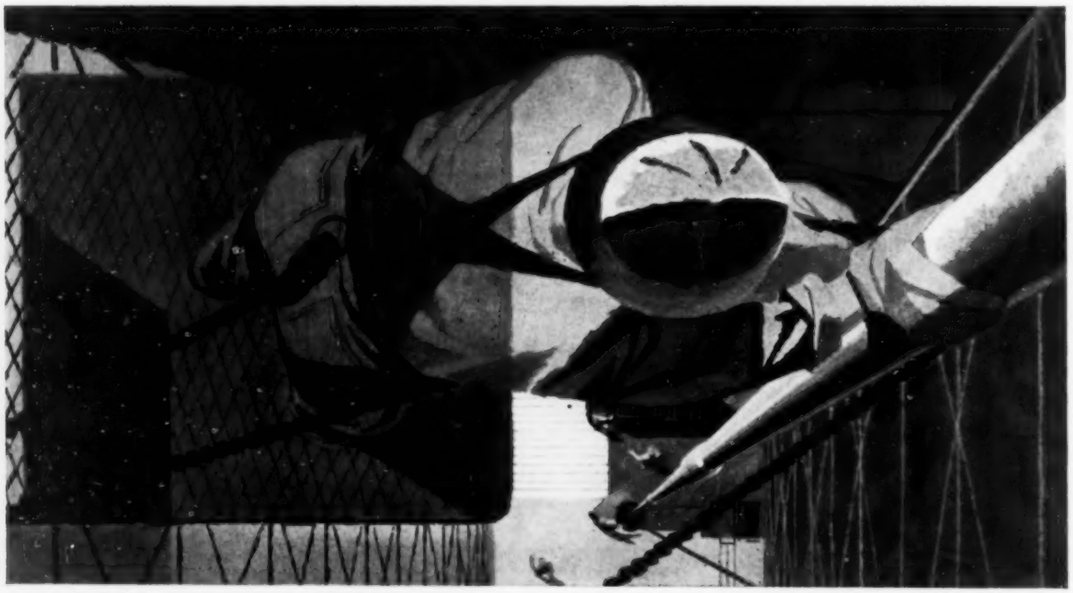
Through offshore mud... in shale... into rock ...through tricky shallows or record depths. The search for oil may take you anywhere in the world on your next job, may find you drilling under any conditions.

Your success – and, of course, your profits – can be greatly influenced by your choice of equipment. Tubular materials, for instance. How much punishment will they be able to take? How will they react under varying pressures, angular drilling, difficult bottom conditions? You can answer with more assurance when your choice of oil-drilling equipment includes U.S. Steel's National Seamless Oil Country Tubular Products. Ideal for any conditions today, ready for whatever tomorrow brings. World-famous for varied work, their strength and dependability are twofold. First, each seamless tube is pierced from a solid billet of steel. Secondly, only steel of the very best forging properties and of the highest uniformity is used, since modern piercing tends to uncover any hidden defects. So for drill pipe, casing and tubing that is more than equal to the specifications, giving the most dependable service for the price, specify U.S. Steel's National Seamless Oil Country Tubular Products.



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National Deep-Well Casing – The strongest casing produced under API specifications to meet constantly increasing depths. Due to the severe service for which it is intended, it is also hydrostatically tested to 80% minimum yield strength up to a maximum of 10,000 psi.

National Buttress Thread – Developed to satisfy the need for a casing joint which will safely and economically support the weight of deep-well casing. The buttress-thread joint is comparable in strength to that of the body of the pipe.

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Mid-Continent Rotary Tables are engineered and designed to withstand high rotating speeds and heavy loads under the toughest drilling conditions. Manufactured by Mid-Continent Supply's subsidiary, Unit Rig & Equipment Co., these Mud-Proof rotary tables are constructed to provide maximum strength and rigidity with minimum weight. Only the finest parts go into the Mid-Continent table, assuring smooth, trouble-free operation.

Assembly of tables nearing completion shows grooving for triple labyrinth seal. They will be balanced electronically during final inspection to relieve vibration stresses on bearings and gear.

Mid-Continent Rotary Tables are available in four sizes: **S—17½-A Short; S—17½-A Long; S—21A Long; and S—27½-A Long. For complete information about these rotary tables or any item of drilling equipment, contact your nearest Mid-Continent representative.**

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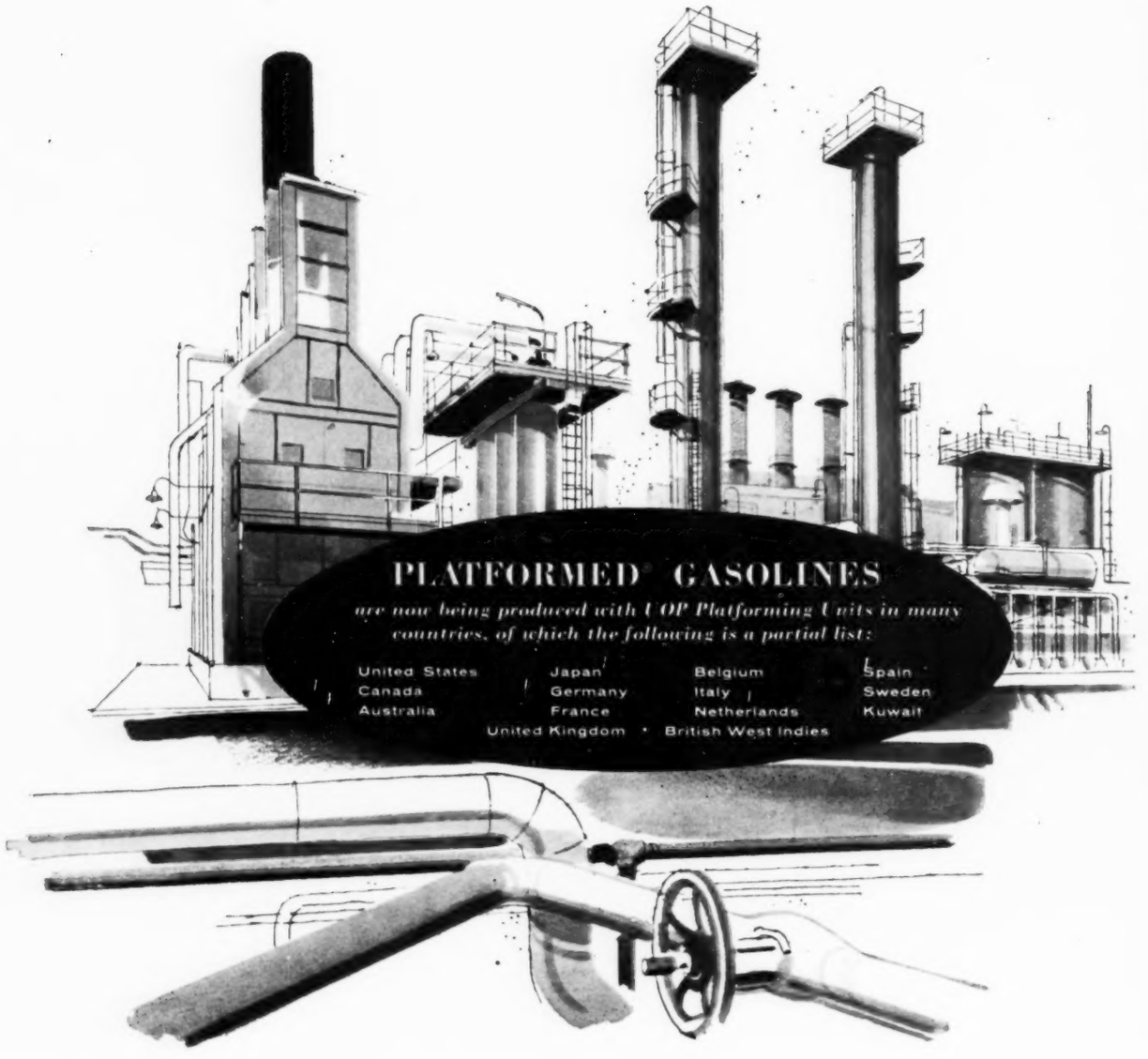

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Petroleum refiners throughout the Free World have already supplied motorists with nearly 50,000,000,000 gallons of

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This year marks an important anniversary . . . the anniversary of an announcement that made significant history throughout the petroleum refining industry.

In March of 1949, Universal announced an important achievement in the field of catalytic reforming. In October of the same year, the first Platforming unit was placed in operation at a Muskegon, Michigan refinery. The new process, Platforming, literally revolutionized the entire concept of processing to improve motor fuels. It made previous methods of refining completely obsolete.

In addition to its value in producing superior Platformed gasolines, Platforming has also proved highly efficient in producing aromatic hydrocarbons, thereby providing the basis for the great petrochemical developments which have since taken place.

The rest of the story is a matter of history. Though many improvements and modifications have since been made, the same basic Platforming process has been applied by refiners throughout the Free World, and now accounts for a large proportion of all the reforming carried out today.

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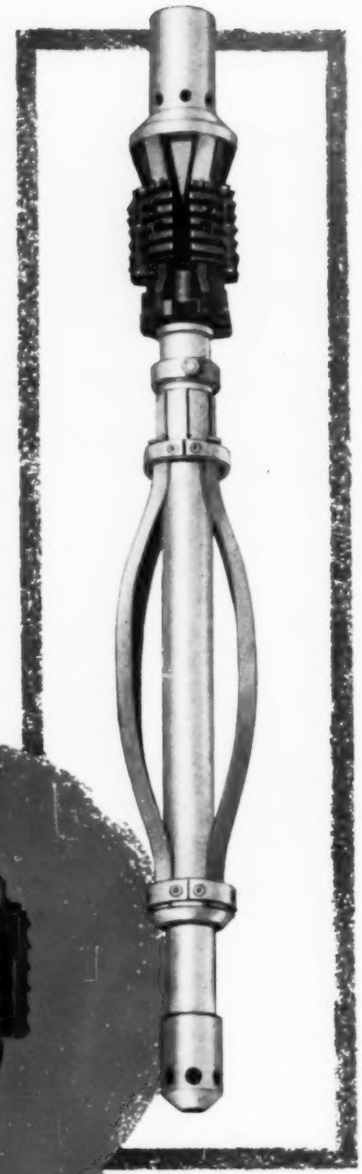
Eliminate Tail Pipe
Insure a Good Packer Seat

specify the new Johnston Open-Hole Anchor

Many advantages are offered with this New Johnston Open-Hole Anchor. This is a slip-type device which has wide application because of its flexibility.

The slips are designed and built to give an extra large expansion diameter. This insures seating in wells where the hole may be slightly over drilled diameter.

The Open-Hole Anchor is easy to operate — has simple, positive-action "J" setting. A spring locking nut, incorporating buttress threads, allows easy re-setting of the anchor. When testing is completed, 6 turns to the right allows you to rotate out of the hole.



THE PROOF---

Hansford County, Texas
Conventional test at 8800' in 7⅞" hole. Used Anchor and single Bob Tail Packer only. No tail pipe. Mud weight 9.8 lbs., estimated 120,000 lbs. on packer and setting tool. No slipping of tool, no problems. Test successful.

Hansford County, Texas
Straddle test in 7⅞" hole between 3,000' and 4,000'. Anchor set on first attempt. No wash pipe used. Test successful.

Hansford County, Texas
Straddle test in 7⅞" hole between 6,000' and 7,000'. Tool set on first attempt. No wash pipe used. Test , successful. Second test run between 5,000' and 6,000'. Packer failed to seat in washed out hole. Moved up hole, tool and packer set on first attempt.

Hansford County, Texas
Straddle test in 7⅞" hole between 5,000' and 6,000'. Tool set on first attempt. No wash pipe used. Test successful.

Liberal, Kansas
Straddle test between 5,006' and 5,016'. Tools worked well. No trouble. No wash pipe used. Test successful.

Liberal, Kansas
Selective zone tests between 3,907' and 3,915' and 4,672' and 4,680'. No problems encountered. Tools worked perfectly. No wash pipe. Test successful.

Liberal, Kansas
Two straddle tests run between 4,662' and 4,678' and 4,577' and 4,614'. Both tests O.K. No trouble whatsoever. Tools worked as expected. Test successful.

Eliminates the need for tail pipe on conventional tests and straddle tests.

Offers flexibility in finding packer seat. If seat is not obtained on initial attempt just pick up and re-set the tool.

You can profit from the savings in dollars and time when you specify the Johnston Open-Hole Anchor. Ask your Johnston representative for full information. You'll be glad you did.

JOHNSTON DRILL STEM TESTING TESTERS

P.O. Box 98, Houston 1, Texas

Clayton Weaver, *Superintendent (left), and* Forrest Holcomb, *Cracking Plant Operator, Leonard Refineries, discuss function of air supply in catalytic cracking and...*

How Cooper-Bessemer centrifugal compressor supplies big-volume air 'round-the-clock

As "Doc" Weaver, Superintendent of Leonard Refineries, Inc., Alma, Michigan explains..."Big centrifugals are the answer, of course, where modern processing calls for an extremely dependable air or gas supply at high volume and relatively low pressure. For example, our catalytic cracking requires this kind of air supply for burning coke off the catalyst. Our Cooper-Bessemer Type RS Centrifugal Compressor delivers 31,500 cfm at 30 psi discharge pressure. And, it produces this flow on a continuous, 24-hour basis. We are mighty pleased with its reliable performance."

Find out how Cooper-Bessemer Centrifugal Compressors can help solve *your* processing, air supply or compression problems for optimum economy. There is a type and size of unit for every need. Call our nearest office for complete details.

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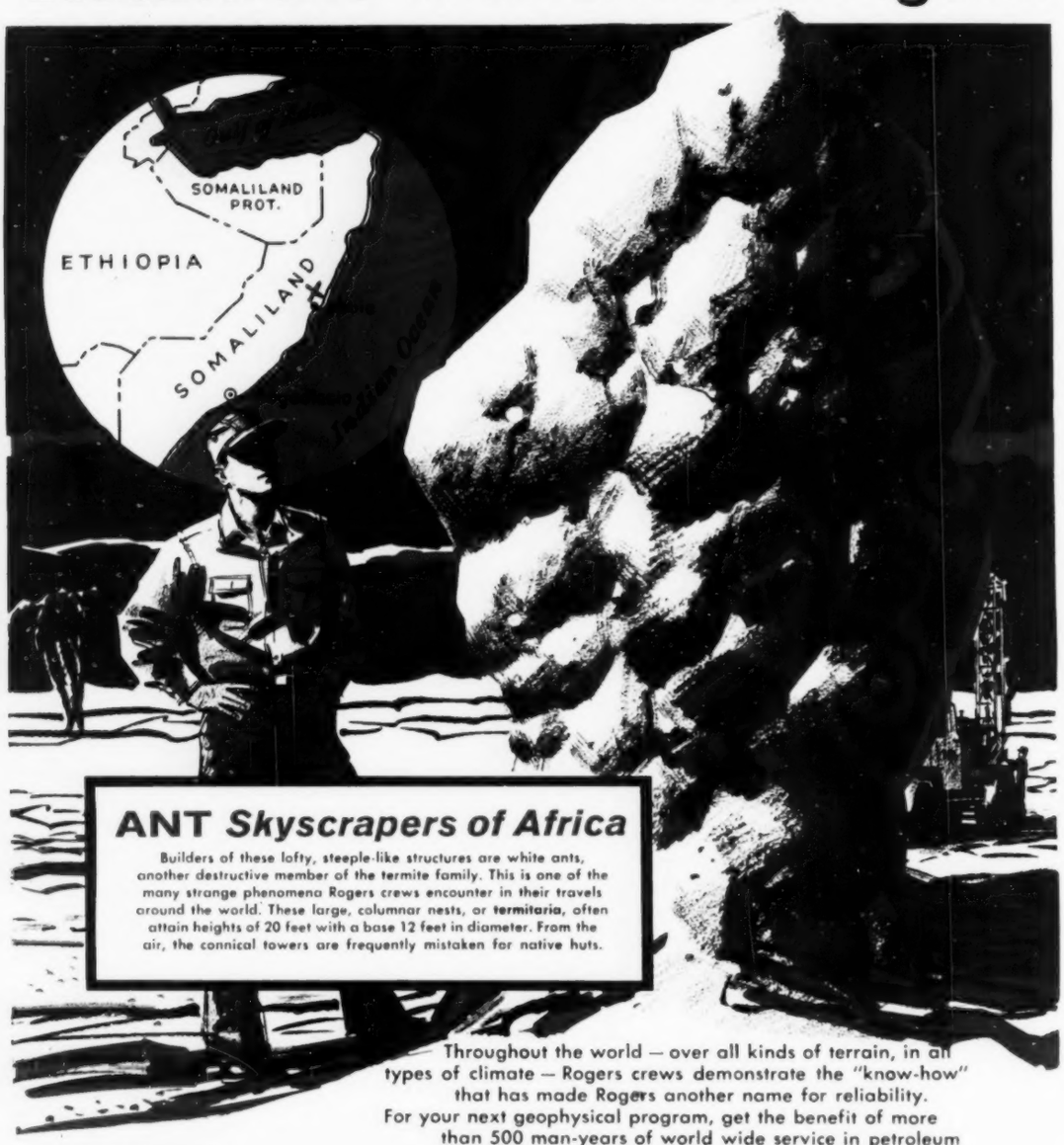
'Round the World with Rogers



ANT *Skyscrapers of Africa*

Builders of these lofty, steeple-like structures are white ants, another destructive member of the termite family. This is one of the many strange phenomena Rogers crews encounter in their travels around the world. These large, columnar nests, or **termitaria**, often attain heights of 20 feet with a base 12 feet in diameter. From the air, the connical towers are frequently mistaken for native huts.

Throughout the world — over all kinds of terrain, in all types of climate — Rogers crews demonstrate the "know-how" that has made Rogers another name for reliability.

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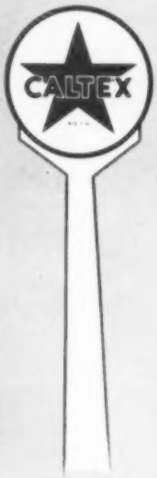
ROGERS' CREWS GO EVERYWHERE

NEW. CALTEX BOOKLET AIDS EUROPEAN MOTORISTS



So that Caltex can be of even greater service to European tourists than it has been in the past, Caltex has made available a 42-page, fully illustrated, vest pocket size booklet, "Driving Abroad."

This booklet describes how to prepare for a trip in European countries and what to take along. It provides considerable driving and road information. It also contains many valuable charts and conversion tables.

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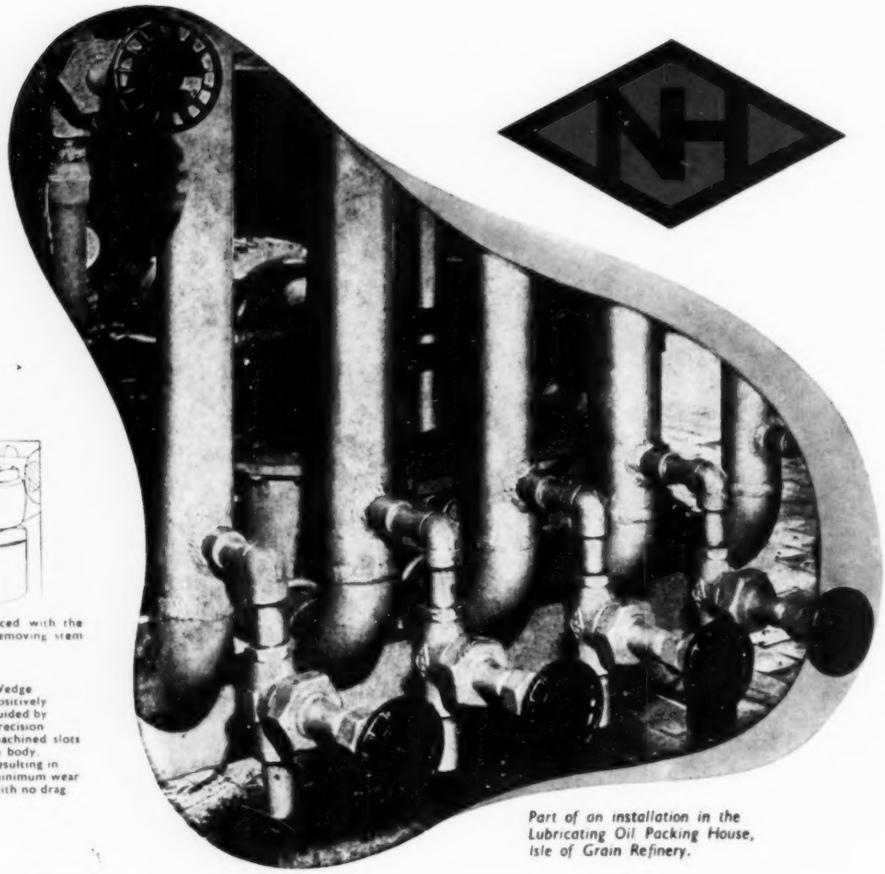
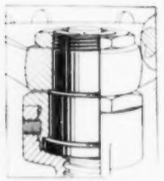
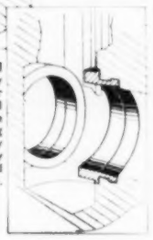


Part of an installation in the Lubricating Oil Packing House, Isle of Grain Refinery.



Yoke sleeve can be replaced with the valve in service without removing stem or bonnet.

Wedge positively guided by precision machined slots in body, resulting in minimum wear with no drag.



Seats rolled into body under controlled pressure eliminating any possibility of cracked skirts.

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It's the hard hat of *experience* gained on rig floors throughout the world during the past 50 years.

It's *experience* gained in making rock bits that have drilled over two billion feet of hole.

It's *experience* gained in the research laboratory where for a half century we have studied the drilling characteristics of rock bits, the performance of materials, and tested the soundness of new ideas.

It's *experience* gained in making specialized tools for rotary drilling since 1909.

We wear our hard hat with pride . . . because it is a symbol of the countless rig floors trod by Hughes men . . . of the nights . . . the days . . . the months . . . the years that we have worked elbow to elbow with the men who have made drilling history.

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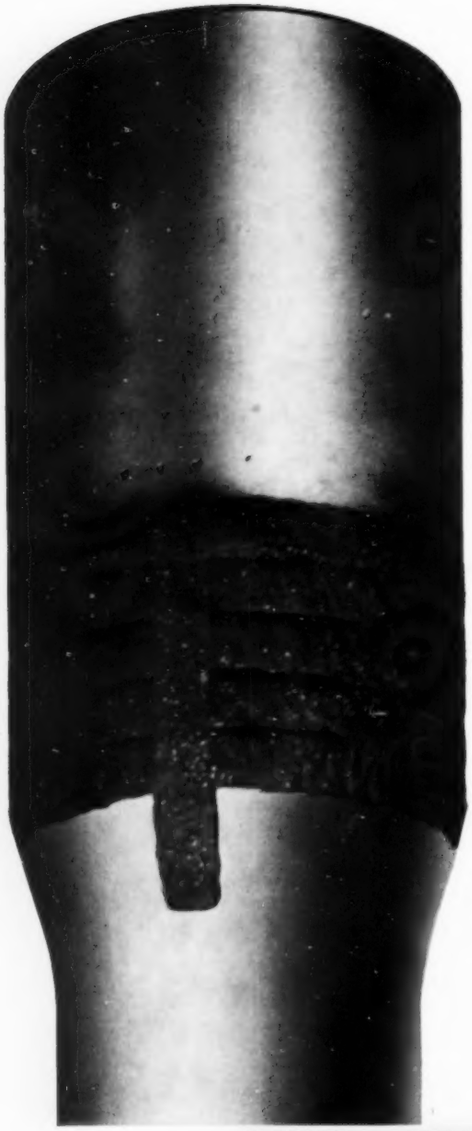

Hughes FLASH-WELD is now 21

At 21, Hughes "Flash-Weld" is the most experienced welded tool joint-to-pipe connection in the oil fields.

Since 1938, when Hughes introduced the first flash-welded drill string, *more than 40 million feet* of drill pipe have been unitized by the "Flash-Weld" process.

A new heat treating process has *more than doubled* the tension impact strength of "Flash-Weld" pipe connections. And new processing controls are improving the quality of the finished drill strings.

In addition to exacting physical tests, "Flash-Weld" tool joints and flash-welded connections undergo a series of critical inspections. For instance, after flash-welding, all weld areas are subjected to magnetic particle inspection. The critically-stressed areas of the tool joints themselves (this applies to all Hughes joints) are magnetically inspected. And the hardfacing on the joints is "snow" tested to check the bond of the hardfacing material to the joints.

The Hughes method of hardfacing, plus Hughes' specially developed tungsten carbide hardfacing material, assures maximum protection against wear during the life of the joints.

FLASH-WELD
A DEVELOPMENT
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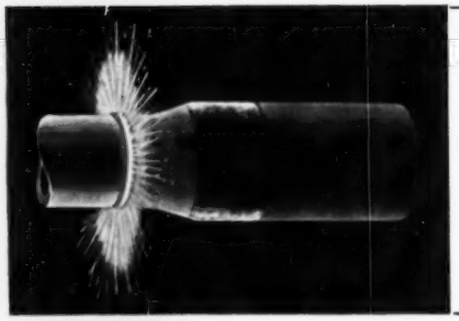
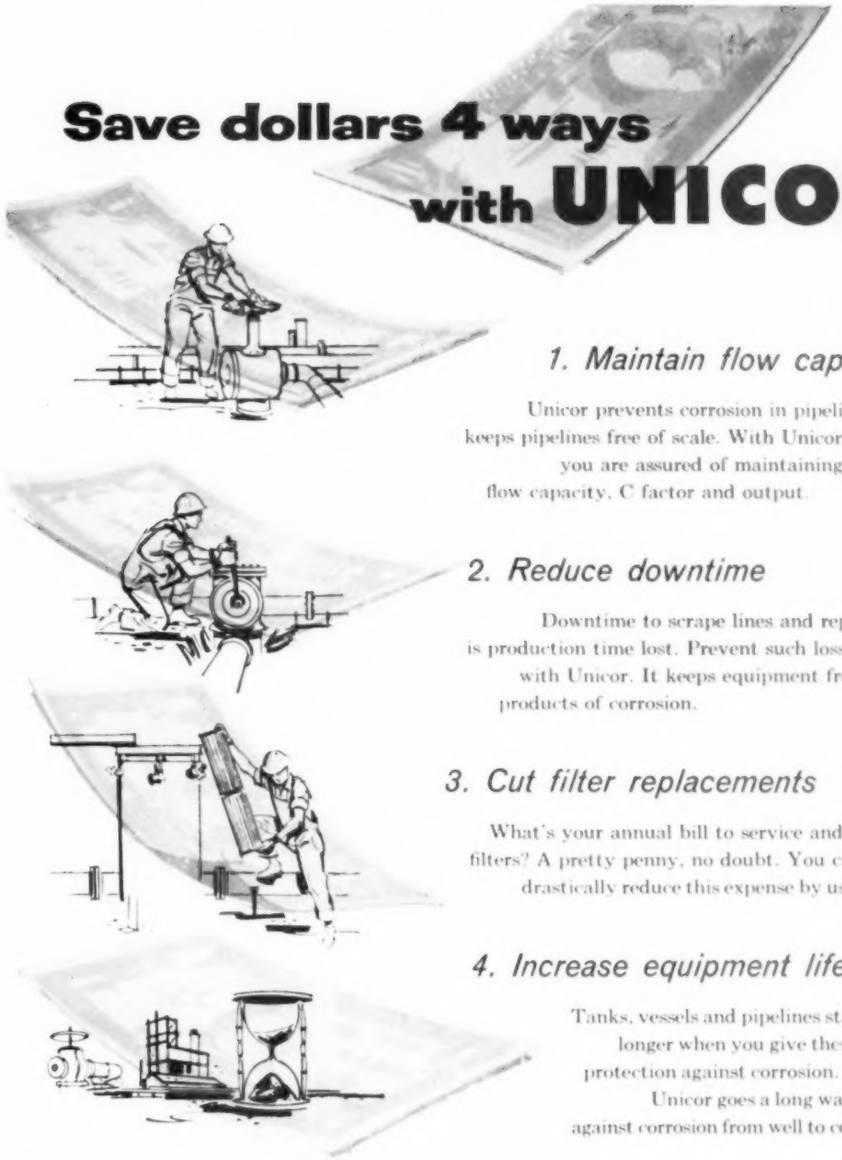


Complete line of "Flash-Weld" joints is available for attachment to new API LIGHTWEIGHT drill pipe, as well as standard weight pipe. Ask your Hughes man.

"Flash-Weld" joints are available with tapered and square shoulders

Save dollars 4 ways with UNICOR®



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Venezuela's Problem

Venezuela is deeply disturbed by the surplus crude supply available to world markets and the tendency of producers to reduce prices in an attempt to obtain more business.

Two efforts have been proposed to correct the situation. The first was proration on an international scale, with various producing nations restricting their output to an agreed level. The second proposal is for proration in Venezuela itself without relying on the Middle East to follow suit. For this latter program Venezuelan authorities have obtained the services of an American expert on proration practice in the United States.

In one respect Venezuela has natural market conditions operating on its side. The spectacular growth of demand in Europe is based on a conversion of industry from coal to oil as well as on industrial expansion. From a fuel oil standpoint, most Venezuelan crudes are superior to Middle East oils because of the higher content of residuals and the lower gasoline yield.

This natural advantage for Venezuelan oil is being overcome by changes in processing and by other market factors, however. Some of the newer European refineries can run Middle East crude and obtain a yield of only 15 percent of high octane motor fuel. Low grade naphthas are being converted to chemical intermediates for the manufacture of plastics and other specialized products outside the energy market.

In any case Venezuelan oil is being squeezed out of Europe. Not only is it unable to retain a proportionate share of the growth in demand, it is sustaining a volumetric loss. Shipments of Venezuelan oil to Europe dropped nearly 140,000 barrels daily in 1958 as compared with 1957 while Western European demand was rising about 230,000 barrels daily. This was partly the effect of the return to more normal intercontinental trade patterns following settlement of the Suez crisis, yet Suez cannot be blamed entirely for the loss. Ten years ago the Caribbean, in which Venezuela predominates, supplied a third of the Western European oil market. By 1958 the Caribbean share had dropped to about 15 percent. Then at the close of 1958 Venezuela increased her taxes on oil producers, thus making Caribbean crude even less attractive in Europe.

The future market for Venezuelan oil in Europe looks even darker because of the North African discoveries. Oil from the Sahara will have an economic advantage because of the lower transportation cost when compared with either the Middle East or the Caribbean. Obviously the rich French market will be dominated by Sahara oil for currency exchange and political considerations as well as net cost.

There are still other clouds on the horizon. Both Argentina and Brazil are making great efforts to increase domestic production of crude, and in the case of Argentina at least, the prospects are quite good. In 1958 southern South American nations produced 235,000 barrels of oil daily and consumed 848,000 b d. Shipments into the area from the Caribbean were well over a half million barrels daily, and the loss of any major share of this business would be a sad blow to Venezuela. Canada, also, has been a very good customer for Venezuelan oil, importing over 200,000 barrels daily. Last year, however, Canada almost doubled its imports from the Caribbean. Canada also is still talking about extending its crude pipeline system to Montreal from the west.

As mentioned earlier, Venezuela has sought to develop the idea that crude markets should be shared by the principal exporting nations on an equitable basis. This is a very difficult idea to sell to the Middle East, where pressures on producers are always strong to expand shipments. It is doubtful whether the group of countries surrounding the Persian Gulf could agree on a division of the European market if there was no competition from the Western Hemisphere.

There is considerable question as to whether proration in Venezuela itself is a wise course. Something akin to what is happening in Canada today might result—as it has in the United States during past periods of surplus. In Canada the province of Saskatchewan does not prorate. Alberta does. Result is that Alberta proration is becoming more stringent from year to year and Saskatchewan fields are being operated at MER.

If Venezuela limits production it will not create an artificial scarcity of petroleum under present world conditions. On the contrary, the business will be taken by other nations, and once lost it may be rather difficult to regain. Would not a wiser course be to use every means of trying to stimulate business for Venezuela producers by helping them compete with others? Moderation of severe taxation is one such step which would be most helpful and could well increase rather than decrease national income. Restriction of production of any commodity has wide effects on a national economy—in employment and general business.

Restrictions on imports into the United States cannot continue long in the face of present difficulties in finding new oil. If Venezuela wishes to retain the rich American market, she must remain competitive with North Africa, Canada and the Middle East.

ANDRE CHARON, president of CPA (Compagnie des Pétroles d'Algérie), since 1945 has also been president of Shell Française and the Societé des Pétroles Shell Berre. He also is a member of numerous other boards, such as CREPS and Bataafsche Petroleum Maatschappij.

Six years of exploration

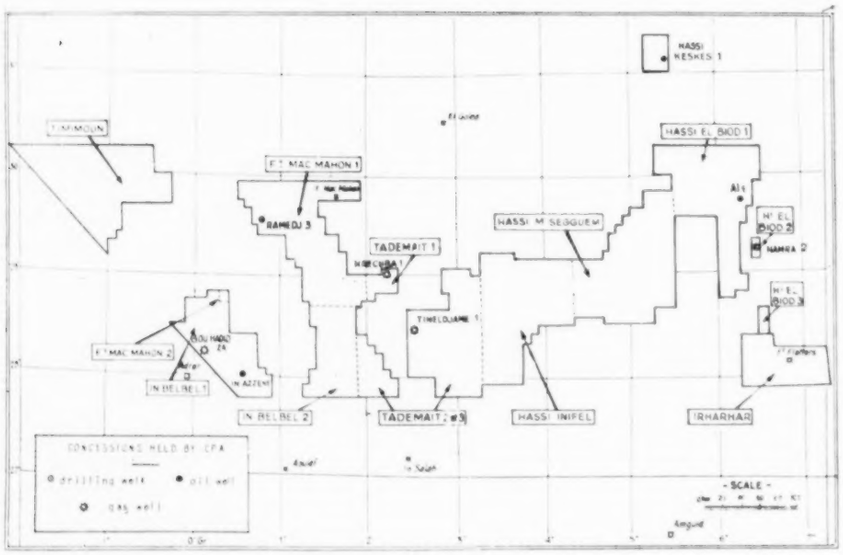
by Andre Charon

EVEN through fortune, the oil man's idol, has already smiled on several pioneers of exploration for petroleum in the Sahara, the Compagnie des Pétroles d'Algérie is still awaiting its reward for perseverance.

In 1953, four companies obtained concession areas covering some 600,000 square kilometers. The SN REPAL, a government company, and the CFP (A), subsidiary of the Cie. Francaise des Pétroles, work together in the respective concession areas which they have obtained in the northern Sahara. In 1956, their efforts were rewarded by the discovery of oil at Hassi Messaoud and gas at Hassi R'Mel.

The other two companies, financed by some French capital and the Royal Dutch/Shell group, have obtained rights in part of the central Sahara: (1) CREPS (65% French capital and 35% Royal Dutch/Shell group) have obtained 130,000 square kilometers to the south of In Salah and near the Libyan frontier; it is this company which, at Edjeleh in January 1956, made the first discovery in the Sahara; (2) the Cie des Pétroles d'Algérie CPA (65% Royal Dutch/Shell group and 35% French capital*) has received a rectangle about 160,000 square kilometers in area, between the 28th and 30th parallels and the meridians 2° W and 7° E of Greenwich.

*Distribution of CPA's capital: Royal Dutch/Shell group, 65% SOGERAP (holding company of the Régie Autonome des Pétroles), 24%; Bureau de Réchèrches de Pétrole, 4.5%; FINAREP, 3.5%; COFIREP, 3%.



In accordance with current legislation, CPA had to give up 50% of its initial area. On the other hand, the area has been enlarged by several more concessions in the region of Fort Flatters, in the Eastern Erg, and in regions relinquished by the CFP (A) and SN REPAL, near Hassi Messaoud, covering about 14,000 square kilometers, in which the CPA is in 50-50 partnership with CREPS. The present total prospecting area, therefore, amounts to about 100,000 square kilometers.

Working Conditions in the Sahara: Difficulties with which the company has to contend are mostly inherent in geographical conditions: the immense desert, which is the largest in the world; the almost complete absence of population; and the practical non-existence of economic life there.

It was necessary to provide CPA with an apparatus to surmount these difficulties. The first thing was to create rudimentary bases for operations. The initial concessions extended nearly 1,000 kilometers from east to west, and were situated more than 1,000 kilometers from the coast —1,000 kilometers of mountains and desert . . . A particularly barren and inhospitable rocky plateau, the plateau of Tademaït, occupied the center of it. On its flanks, the two great regions of the Eastern and Western Erg were entirely covered by high sand dunes, and were inaccessible to vehicles when operations started.

The concessions were served by only two roads, or rather tracks. One runs from Oran to Gao; the other connects Algiers with Tamanrasset and Nigeria. One must have used them before one can have any idea of the Sahara tracks—completely washboarded, sown with holes, cut by torrential wadis when it rains, and barred by sand dunes.

CPA had to create in its concession area a network of supplementary roads (about 2,000 km of them), some more or less provisional, for exploration parties and the drilling rigs.

At the beginning of exploration, only a few makeshift airfields existed, in the principal oasis. Since then, 33 new airstrips have been made; for the airplane plays a dominant role. By "road" it takes several days, sometimes even a week, to get from Algiers to the drilling sites; by air, they can be reached within a few hours. Men, mail, and fresh food; everything which is urgently needed, fragile or perishable, goes by air.

However, this does not supersede the road, on which trucks continue to carry their cargoes of heavy equipment, provisions—and, of course, water; for water is lacking almost everywhere. Certain drilling rigs are supplied from wells 200 km away. The shuttle

in the Sahara

service of road tank cars, which often make only one return journey in a day, is an impressive spectacle. As much as 60,000 liters of water may be needed at a rig in one day, and one liter of this water finally costs as much as a bottle of coca cola in a New York drugstore! Naturally, whenever possible, water is obtained from wells drilled close to the rigs.

During the first phases of exploration, the difficulty and uncertainty of maintaining communications forced the company to use large parties, equipped with everything they might possibly need and thus capable of being entirely self-supporting. They numbered from 50 men in the case of gravimetric parties to 100 to 150 in the case of seismic parties. They possessed their own emergency repair equipment, their own repair workshops, a fleet of 15 to 30 vehicles, and were largely capable of looking after themselves in the matter of supply of food and water, and personnel were accommodated in tents. Operations were suspended during the summer, except for the actual drilling, which continued without interruption—the camps at the drilling sites being provided with airconditioned huts.

The parties themselves were attached to bases which provided the facilities of marshalling yards, domestic stores, equipment stores, repair workshops, radio stations, hotels and hospitals. The main bases were located at Timimoun and El Golea.

Little by little, with the development of communications and the establishment at the bases of transport enterprises, tradesmen and public services, the parties have become less elaborate and the bases have lost most of their usefulness. The only one now in existence is that of El Golea, and even that is hardly more than a repair workshop and radio station.

Besides technical problems, there were, and are others, connected with the human element. Although the CPA has had no difficulties in finding its technical staff, local recruitment of the necessary auxiliary labor has presented serious problems. For the people of the Sahara—nomads occupied exclusively with their flocks and herds, and inhabitants of oases with no experience but the cultivation of date palms—are not accustomed to steady work. It was necessary to train completely all laborers and junior employees. In order to meet future demands, the CPA together with the other petroleum companies, has contributed liberally to the establishment of trade and technical schools at several oases.

Geological Background of the CPA Concessions: The Pre-Cambrian massif of Hog-

A road in the Grand Erg Occidental (Great Western Sandsea), showing CPA vehicles in transit (Photo MERE).

View of desert from door of plane used for geophysical reconnaissance.

gar, the major element in Sahara geology, is bounded by large outcrops of Palaeozoic formations. These are particularly well developed on the northern border of the massif, which is covered by the CREPS concessions. Detailed studies undertaken in the past few years, both by the Geological Survey and by those of the oil companies, have revealed the existence of a complete Palaeozoic sequence, almost entirely marine, and up to 5,000 meters in thickness. The conditions under which the Palaeozoic sediments have been deposited appeared favorable for the formation of hydrocarbons. Several series of shaly clays in the Gothlandian, Upper Devonian, and Carboniferous present themselves as possible source rocks. On the other hand, important sandstone reservoirs are found in the Ordovician, the Lower Devonian, and also in the Carboniferous. These last reservoir horizons are generally rather thin, but their porosity is better than that of the Lower Palaeozoic horizons.

A major orogenic phase affected the Palaeozoic formations at the end of the Carboniferous, giving rise to numerous structures the intensity and complexity of which tend to diminish from west to east.

Towards the north, partly eroded Palaeozoic formations plunge below a covering of younger sediments: lagoonal, continental formations of the Jurassic and the Lower Cretaceous, and marine calcareous formations of the Upper Cretaceous and Eocene. The thickness of this covering increases in a west-east direction; in the region of Timimoun it is only 200 meters thick, but it becomes more than 2,500 meters thick in the Settar bore hole. It grows even thicker in the direction of Hassi Messaoud and the new CPA concessions—this thickening being partly due to the appearance of Triassic formations. The Saharan Mesozoic has been slightly affected by Alpine movements which have produced folds with a very large radius of curvature, but which have also produced local accentuated structures, due to a rejuvenation of a certain Palaeozoic anticlines.

CPA concessions are almost situated in the zone in which the Palaeozoic has been masked by more recent formations, and their exploration, therefore, depends essentially upon the results of geophysical surveying. Before being able to select the sites of its first test wells, CPA had to make very great efforts in the spheres of gravimetric and seismic surveying, and also had to drill a large number of stratigraphic borings.

Operations by CPA: Exploration work began some six years ago, if the first geological reconnaissances are left out of account. Nearly twenty thousand million francs have been spent by the CPA in these six years, equivalent to some $57 million at the average rate of exchange during that period.

From 1952 to 1955, several geological parties, aided by aerial photography, explored the concession area. Their activity also extended to neighboring regions, with the object of investigating type sections of Palaeozoic formations, and of studying the tectonic style of the Hercynian structure. The work of geological reconnaissance is now practically finished, but, on the other hand, subsurface studies and studies of sedimentary petrography and paleontology are developing rapidly

As has been indicating in the preceding chapter, the situation of the CPA concessions involves large-scale employment of geophysical methods.

The CPA has used as many as four gravimetric parties at the same time. Since 1953, some 80.000 stations were measured; the density of the observations network varied from 0.3 station per square kilometer in regions difficult of access, to 0.6 station per square kilometer, the average being 0.4. Operations were carried on even into the Ergs, in which transport took place in Land-Rovers equipped with special tires, on camel-back, or on foot. Parties working in the Ergs were supplied with food by parachute. An interesting point about gravimetric operations was the employment of an electromagnetic triangulation system (Decca) for topographical work. The CPA no longer possesses its own gravimetric party, but a contractor's party has just carried out a survey by helicopter in the Eastern Erg.

Since 1954, two seismic parties have been at work. A long period of experiment (nearly two years) was necessary before a satisfactory working method was found; the Cretaceous lime-stones which outcrop throughout the greater part of the CPA concession make shothole drilling very difficult. Moreover, these formations absorb a great part of the seismic energy. The method employed now consists in surface shooting using a variety of systems, and in the employment of multiple seismometers. Whereas the original output did not exceed 30 km per month per party, it is now more than 200 km.

In some regions where conventional methods produced no results, the CPA has had recourse with success to the use of the weight-dropping techniques.

In all, more than 10,000 km of seismic profiles have been observed since commencement of exploration.

As regards drilling proper, operations started at the beginning of 1954 with two medium rigs. Drilling operations are now being carried out with one medium rig (an Ideal 50) and three heavy rigs (Emsco GB. 800, Ideal 80.B and Super 7-11 Ideco).

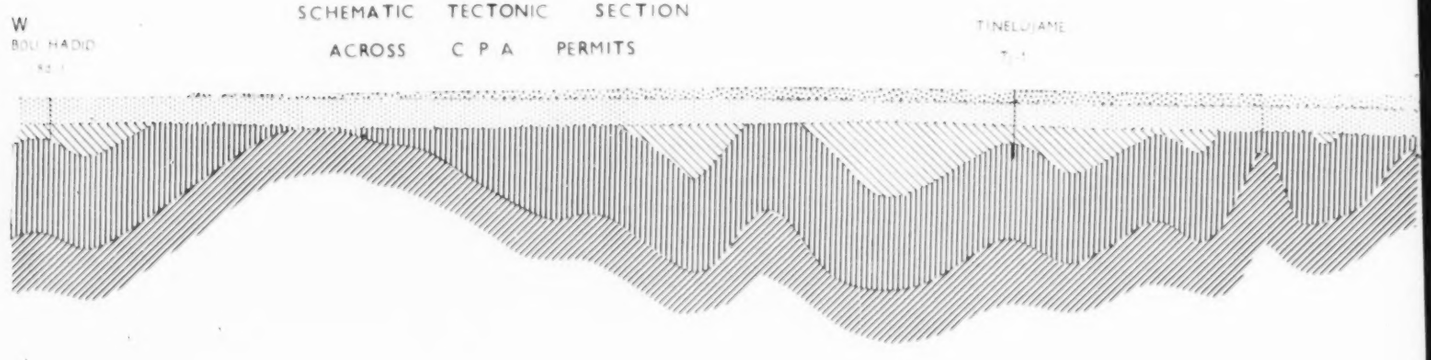
Up to now, 43 wells have been drilled, total metreage being more than 70,000; of these, 13 were stratigraphic wells, drilled to correlate geophysical results with concrete stratigraphy.

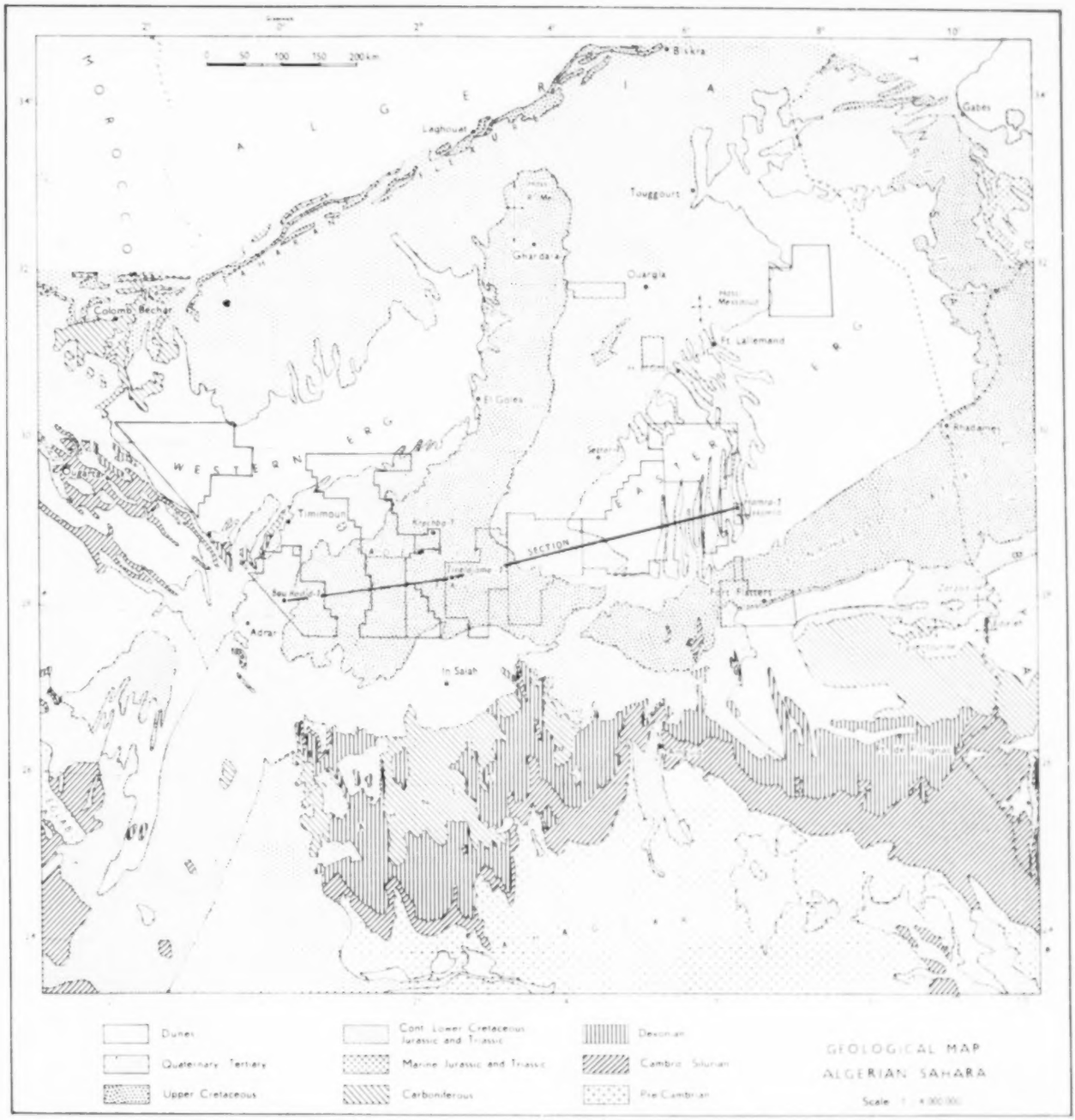
Although, up to the present, no commercial deposits were discovered, hydrocarbons have been found in several areas. In the Plateau of Tademaït, two wells Tineldjame and Krechba produced dry gas in the Tournaisian, at rates of 360,000 and 180,000 cubic meters per day respectively.

At the end of last year, wet gas was found in the well of Hamra 2 situated in the concession block of El Biod. Production of 150,000 to 180,000 cubic meters per day have been obtained between 2,000 and 2,200 m in the Devonian.

More recently, oil was found at In Azzene, in the concession area of In Belbel. Tests carried out in the lowermost part of the Devonian yielded some 50 cubic meters per day. Unfortunately, this discovery did not prove to be commercial. However, it should be pointed out that In Azzene is the first well which found oil in the western part of the Sahara.

Even though no spectacular discovery has been made to date, a store of information of considerable value has been accumulated in the course of these recent years. Methods have been perfected, and the aims to be achieved have become more clearly defined. However, vast areas still remain to be explored, both in older concessions and in those recently granted. Strong in its experience—sometimes dearly bought—CPA faces the future with confidence. END

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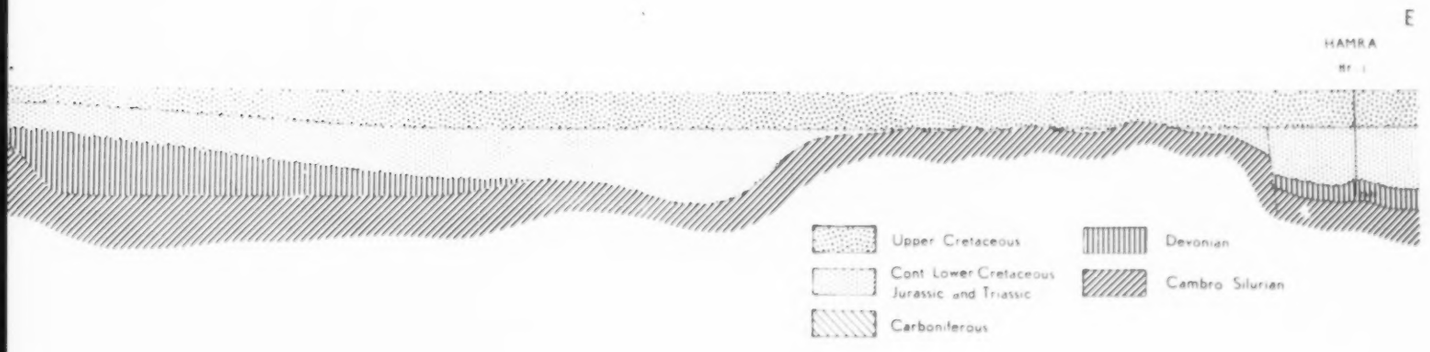
GEOLOGICAL MAP
ALGERIAN SAHARA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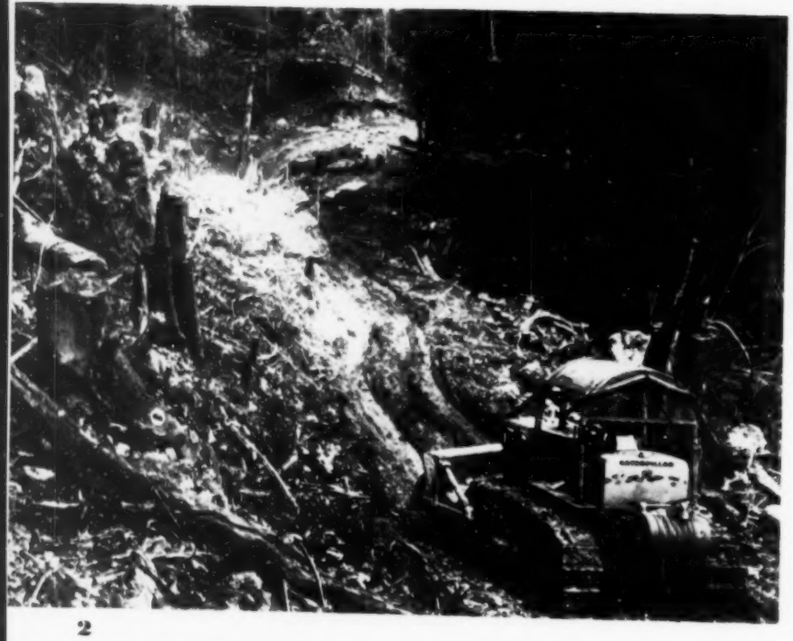

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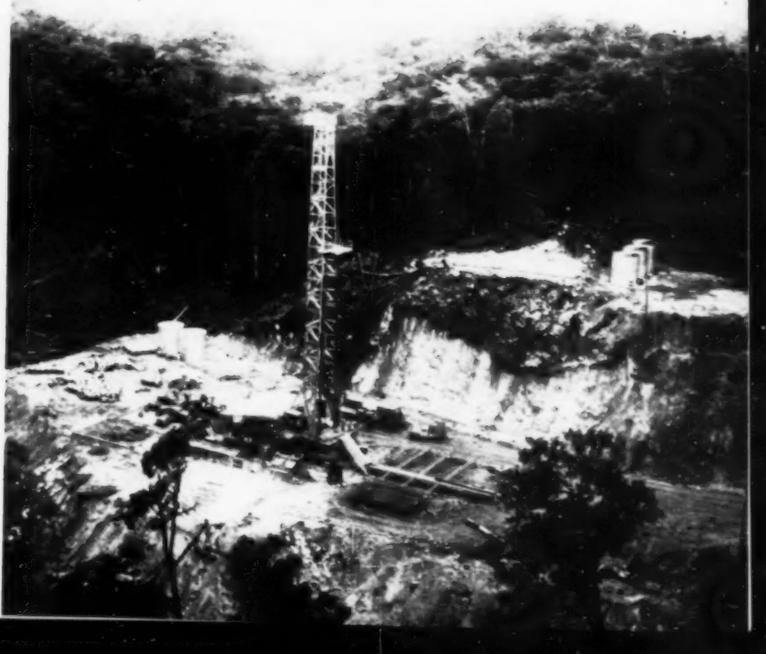


World's wildcats reviewed

The world crude oil surplus may rule out a price increase for 10 to 15 years, but exploration is continuing at an increasing rate. Most spectacular is Libya, which may now have 50 billion barrels of reserve, based on recent discoveries there.

World Wildcats

The number of wildcat wells abroad is steadily increasing, despite the current crude surplus. Evidently operating on the theory that it takes a decade to establish big production overseas, American companies are not slowing up their hunt abroad in the face of the current world crude surplus but instead are pushing it faster ahead.

All the corners of the world share in the exploration dollar, from Canada's Arctic circle down to Argentina's grass plains. Across the Pacific to the west, Australia is sharing in the boom; and in the opposite direction, Libya, Algeria, and Spain.

Many indicators point to the increasing trend toward operations abroad for American companies. World reserves are 80% abroad, production is now greater abroad, and so is refining and consumption. The number of rigs is not yet greater abroad but there, too, the rest of the world will overtake the United States and by 1965 the number of rotaries operating abroad is estimated to equal that within the United Staes. We follow now with a country-by-country review of where the exploratory bits are rolling.

North America

The general level of exploration has risen sharply during the past year and is presently at the year's peak so far for the United States. The same is true of Alaska, where the summer weather aids operations. The opposite is true of Canada. There the winter freeze is necessary to get drilling rigs in and activity has dropped with every "road closed" sign that comes out in the muskeg areas.

United States:—Drilling has shown a steady improvement recently, principally due to the higher domestic production levels. These in turn are due to a general economic upturn and, in part, to the import restrictions. The total rigs making hole was up to 2,284 on June 23 of this year, and this is exclusive of rigs engaged in logging, cementing, fishing, testing and other operations. Rigs should reach an estimated 2,300 later this year. The total of rigs active, including cable tools, now probably exceeds 4,200. There were no "big field" discoveries reported, however, in line with the recent trend in U.S. exploration.

Canada: The total of drilling completions was slipping badly at the midway point of 1959. The June total of 220 was off 12½% compared with June 1958. Most of the decline was in Saskatchewan. Alberta completions held up well.

The Berland River strike, widely heralded as the world's largest gas well last year, received a disappointment when a stepout found only water in the productive zones. It is evidently much less potent that originally supposed. Canada's general gas reserve estimates have been revised downward lately.

A one-trillion cubic feet field is estimated to have been encountered in Dick Lake (Alberta) by British American. This is another of the fields that will be hooked to Trans-Canada before long.

Two of the most important discovery wells in the Swan Hills area of northern Alberta may have extended the field by 18 miles to the south. B.A.—Pan American Sarah Lake and Imperial Judy Creek wildcats, indicated commercially successful, give strong intimation of continuous reef structure south for main pool. The new oil discovery area south of the Swan Hills oil field in north central Alberta is becoming the hottest wildcat region in western Canada. Imperial Oil is moving in five rigs on long stepout wildcats surrounding its Judy Creek discovery well and is understood unofficially to rate its strike along with Redwater as the most substantial discovery of the last ten years.

Alaska: Four wells are drilling (as of Aug. 11). Standard-Richfield has the Swanson River Unit 12-27 fishing at 7,622 ft. No. 32-15 is setting casing at 3,010 ft. Union-Ohio is drilling Kenai Unit Well No. 1 at 12,415 ft, no results reported. Anchorage Gas & Oil Dev. Co. has suspended Rosetta No. 3, stuck at 5,400 and is moving the rig to No. 4 location. Alaska Consolidated Oil is drilling below 10,000 ft with Iniskin-Antonio Zappa No. 1. Meanwhile, Richfield has located Kaliakh No. 1 and will start drilling shortly.

General Petroleum Corp., Los Angeles, has acquired 400,000 acres in the Bristol Bay area of Alaska. First exploratory well site will be known as General Petroleum-Great Basins Becharof No. 1. The rig used by Humble Oil Co. to drill its Bear Creek No. 1 well has been moved approximately 65 miles for this purpose.

Central America

The big news for this region was the discovery by Ohio Oil of a few gallons of oil in Guatemala. It was the first concrete sign of oil there, and may indicate that the Mexican trend extends south into the Peten of Guatemala. That would be good news for all concerned. None of the other Caribbean (except Trinidad) and Central American countries have been able to show conclusive proof of commercial oil. If Guatemala fails, this region may never get serious attention again.

British Honduras: Phillips Petroleum abandoned its first wildcat at 10,750 ft about 3 miles northwest of Punta Gorda. A second test is now (Aug. 15) drilling 6 miles west, no shows yet. Gulf has suspended drilling. Bandini sold out to Phillips.

Guatemala; Two wells are drilling and one, Chinajas No. 1, had some shows. It is currently drilling ahead, with Ohio Oil as the operator for a group composed of Union, Continental, Amerada and Ohio. Petroleum Investments (Overseas) Ltd., (Shell) spudded in Laguna Blanca No. 1 on May 18 and is currently drilling with no shows reported. The Ohio shows are highly encouraging as the first oil of any kind encountered yet in the country. All previous tests had been dry.

Costa Rica: Union Oil's drilling operation has been halted temporarily on Costa Rica's Caribbean coast near the port of Limon after reaching 10,500 ft in the latest effort, without success. A new test well was abandoned further south on the coastal section at 6,755 ft.

Cuba: Drilling is going on at several wells, despite unsettled political conditions. Trans-Cuba is drilling Santa Maria No. 1 in Oriente province. Texaco is drilling Mayajigua No. 1 in Las Villas province in the Suagerina concession. A cable tool is drilling for Arabos Commercial Co. at a well on the Yonides concession. Consolidated Cuban Petroleum Corp. is deepening a well on the Lot Salomon concession, designated Consolidated Cuban No. 20. Cuban Kewanee

←

Six Steps to a Jungle Wildcat

1. *Cut a strip through 6 miles of Guatemala jungle.*
2. *Bring in the bulldozers to push out a roadway.*
3. *Build bridges with logs cut from the roadway.*
4. *Haul heavy drilling equipment to the wellsite.*
5. *Rig arrives at shelf 1,000 ft above jungle floor.*
6. *Rig is assembled and ready to start making hole.*

To drill this well Ohio Oil Co. hacked out a 4,000 ft airstrip and flew in six million pounds of rotary equipment from Puerto Barrios. Photos by Gey Gruner for The Ohio Oil Co.

Oil Co. is drilling Santa Fe No. 2 well on the La Fe concession in the Bacuranao area. Petroleos Cruz Verde has a cable tool well at Cruz Verde No. 1, also on Lot C of the Salomon concession. Salomon Oil Enterprise is drilling with a cable tool rig at Cordero No. 4 on the Jose Candido concession.

Mexico: Exploration is proceeding with number of wildcats underway by Pemex. The only outstanding discovery reported recently was about one mile offshore from the state of Tabasco by Edwin W. Pauley drilling for Pemex. The first stepout from this well was about $\frac{2}{3}$ mile away but came in reportedly at a higher rate than the discovery itself, which tested 772 bbls/day from 8,692 ft and 912 bbls/day from 9,676 ft through a ¼-inch choke. Another stepout is drilling.

Pemex' exploration program calls for drilling 477 wells in 1959, 121 of them exploratory. Among the sites Pemex intends to explore is near the town of Palomas, in Chihuahua State. Pemex may also resume exploration shortly in the Ojinaga area, across the Rio Grande from Presidio, Texas. After a number of dry holes in the area, exploration was abandoned there last December.

Nicaragua: No drilling is currently underway, but four concessions over a total of 809,981 acres have been acquired by Occidental Petroleum Corp. They were acquired via interests of the Empire Trust Co. of New York. Two wells are planned to about 10,000 ft depth within the next six months, according to the company's management.

Panama: Champlin Oil & Refining's second well, Agua Cay 1, was bottomed at 6,678 ft; no oil shows. No further drilling is to be done until comprehensive study of geological data has been undertaken. No other companies are drilling now.

Trinidad: Dominion Oil's offshore well in Trinidad, South Domoil No. 1, tapped a relatively rich gas consolidate area with a 48° API gravity. A second rig has been ordered from the U.S. and additional wells are being drilled in the area. The well was a producer at 11,387 ft in the Gulf of Paria, the first successful test by Dominion Oil in Trinidad after seven years of drilling. This is Dominion Oil's fourth in the gulf, and the deepest drilling ever attempted from a floating platform. Because of depth and pressure, drilling was discontinued within 24 hours of discovery.

Trinidad Northern Area Participants' first marine well in the Gulf of Paria this year was a disappointment. It was completed towards the end of January at 9,010 ft and the chairman of Trinidad Petroleum Development revealed recently that although some oil production was proved, tests had not established that the well will become a commercial producer.

South America

Best hunting ground for drillers now is in Argentina. The number of wells drilled there is soaring daily and production levels are increasing with it. The situation is not without implications for Venezuela. Already pressed for markets in competition with Middle Eastern crude, Venezuela will lose the big Argentine market to the domestic producers soon. Combined with Algerian and Libyan finds that may dump 2 million bbls/day on the market in a few years and thereby increase the presure of Middle East crude looking for markets, the situation appears more gloomy for Venezuela than at any previous time. All that would have to happen now would be for Brazil to find major production or, failing that, admit private companies like Argentina did and thereby establish major production. That would put a great squeeze on Venezuelan production indeed.

Argentina: The contracts signed recently with major oil companies have made development drilling spurt ahead. Pan American has already completed 52 wells in the 6 months since it began operations and is going ahead with surprising speed, using 14 rigs. The Carl M. Loeb, Rhoades group is likewise showing a great ability to get wells drilled, with about 21 wells completed in Mendoza by the middle of 1959. None of these are wildcats. The Union and Shell contracts are the only ones of purely exploratory character and drilling there has not yet begun.

Meanwhile, YPF continues to operate although it is beset by difficulties, one of them being $50 million owed it by companies owned by individual state governments for oil supplies. Dr. Horacio Legorreta, YPF president, plans to have 7,884 new oil and gas wells drilled during next six years. Of these, 3,327 are to be drilled by YPF, and 4,557 by private companies.

New drilling contracts have been signed with ENI (the Italian government company), Southeastern Drilling, and Kerr-McGee Oil Industries. Esso and Shell also received large areas to develop under contract. The contracts themselves really form a unique new type of oil regulation, one that probably will be a basic trend for other countries as well.

Bolivia: Bolivian Gulf is drilling its third test, after abandoning Mandepecua No. 2 at about 6,500 ft. The third test is No. 1 Yoay, now below 15,257 ft with no shows reported. Gulf is also drilling El Ced o, a wildcat on its Zone 1 concession, using the rig formerly in Barbados.

Bolivian Oil Co., a Fish Engineering affiliate, is drilling the first of two scheduled deep tests on the Madrejones contract area. Big Chief Drilling Co. of Oklahoma is the contractor and the well is scheduled for 15,000 ft depth.

Location of wildcats by YPFB, the government's oil company, is not known. YPFB drilled 10 exploratory tests last year and is estimated to drill about the same number this year.

Brazil: Petrobras, the only operator, has 56 rigs running. Among the exploratory wells spudded in July are:

Amazon Basin (5): AM-3-AZ (Autas-Mirim); BI-st-1-AZ (Baruri); IB-st-1-PA (Baquia Island); LQ-st-1-AZ (Lago Quirimiri); PE-st-1-AZ (Parana da Eva).

Alagoas-Sergipe Basin (3): CO-1-AL (Candeeiro); PE-st-1-AL (Pescaria); RFS-2-AL (Rio Sao Francisco).

Bahia Reconcavo (3): BA-3-BA (Buracica); MP-1-BA (Massape); TM-1-BA (Taipu Mirim).

Parana Basin (2): LI-st-1-SP (Lins); SD-st-1-MT (Sao Domingos, Mato Grosso).

In Amazonia six geological, seventeen geophysical teams and seventeen rigs are operating; in north-east Brazil, where one geological, one geophysical team and seven rigs are active, oil is reported near the mouth of the Sao Francisco River, indicating the possible existence of a new field between the States of Sergipe and Alagoas. In the Bahia Reconcavo, three geological, seven geophysical teams and twenty-five rigs are operating, marking out the limits of the new fields. Drilling is starting in the States of Espirito Santo and Rio de Janeiro and is continuing in Mato Grosso, Sao Paulo, Parana, Santa Catarina and Rio Grande do Sul.

Chile: Defeat of the oil bill recently meant that international capital would continue to be excluded from Chilean operations. Meanwhile, the government is continuing exploration through ENAP. During mid-1959 an offshore discovery was reported by ENAP in the Straits of Magellan, in the extreme southern part of the country. No details were available on its importance. Five rigs are working, with two of them on exploratory drilling.

Colombia: The principal news was the discovery by Cities Service Co., which announced a new producing well on the Las Monas structure of the two million-acre El Carare area with an indicated daily potential of 800 barrels of 35° gravity oil. The well is producing from 99 ft of perforations at depths ranging from 4,700 ft to 6,372 ft. This is the third producing well drilled on the Las Monas structure by a subsidiary, Colombia-Cities Service Petroleum Corp. An active drilling program is being carried forward to determine the extent of the field. The Colombia project is a joint venture which includes Colombia-Cities Service as operator, Richfield Oil Corp. and Empresa Colombiana de Petroleos. Aguas Claras No. 4 is drilling below 6,000 ft.

Socony has three rigs operating in Colombian exploratory work. Among the recent exploratory tests are Diolo No. 2, Oru No. 5, and Loba No. 1 Socony would like to farm out some of its acreage, if any takers can be found El Campito No. 1, a wildcat in the Lower Magdalena River Basin of Colombia, was announced by Amkirk Petroleo Corp., wholly-owned subsidiary of Ambassador Oil Corp. of Fort Worth. The wildcat will test Eocene sands on a block of approximately 24,000 acres on a farmout from International Petroleum Co. of Colombia.

Ecuador: Santiago Petroleum Corp. has sold Tennessee Gas Transmission 1,530,000 acres of oil properties in Ecuador. Terms include cash payment of some $1.7 million and an obligation to spend $870,000 on ex-

ploration during next two years. Santiago retains 3% overriding interest, which may increase to 4% if production reaches 10,000 b/d.

Davis Oil Co. has taken oil exploration and operation rights on a concession of approximately 11 million acres in Ecuador and will proceed with geophysical and geological work. The concession lies along the coast in the west central portion of Ecuador.

Peru: Exploration in the Montaña region received a serious setback when Texas Petroleum Co. halted drilling and exploration activities. All but 2 million acres of the company's holdings are being given up.

A discovery has been made offshore by Cities Service and Richfield. The well tested 416 bbls/day of 38-gravity oil through a ¼-inch choke from 2,807-2,996 ft. A previous test was abandoned. The drilling barge "Rincon" is being used. The well is not considered important.

Cia. Petrolera del Pacifico (Douglas Oil Co. of California et al. 40%) acquired drilling concessions on an additional 91,000 acres offshore of northwest Peru early this year. The acreage is next to the 26,000 acres Douglas assigned in 1958 to Peruvian Pacific Petroleum Co., Cities Service subsidiary. Richfield Oil Corp. has a 50% interest in the Peruvian Pacific operation.

Belco Petroleum Corp. of Peru plans to drill 12 wells in the coming year on sites to be selected. Belco has 8,900 hectares on the continental shelf adjacent to the La Brea-Parinas concession of International Petroleum Co. Belco may drill in the continental shelf zone as Pacific Petroleum Co. has had favorable results there.

Paraguay: Pure Oil Co. has spudded its third wildcat in the Chaco region, No. 1 Lopez, about 150 mi. south of the company's No. 1 Madrejon, abandoned at 5,668 ft. Its second wildcat, No. 1 Lagerenza, was recently abandoned at 9,488 ft.

Venezuela: Exploration has slowed very markedly in Venezuela, as companies cut their investment in nearly all industry phases to keep earnings up. Drilling on July 1 is shown in the accompanying table. Among the new developments was a Pan Venezuelan Oil Co. announcement that its first offshore wildcat would be spudded this year on the 22,000 acre tract it won in 1957, Block 7. It lies northeast of the Paria Operation discovery well, Posa 112-1.

In Lake Maracaibo, Superior continues to be the outstanding performer on new leases with a total of 22 wells, all producers, as of July 1, 1959 and a total production potential of 90,000 bbls day. The company recently had its first dry well, Lama 24, just north of the northeastern corner of Sun Oil Co.'s Block 1. This evidently brings to a halt Superior's spectacular successes in the tract.

Sun Oil Co. had 27 producers as of June 1, 1959 with no dry holes, including one (SVSX 1) which produces from the Cretaceous, first in the Lake to do so. Sun has two rigs running now and expects to spud a wildcat soon in the southern part of Block 12 west of its prolific Block 1. Two wells drilled earlier were suspended with only meager prospects for production.

Phillips Petroleum Co., operating Blocks 10 and 17 in the Lake, had 3 producers, 3 nonproducers and one drilling well on Block 10 at mid-year. The company extended its Lot 17 oil field in Lake Maracaibo 1,900 ft to the south with a new well, LPG 16-9, during July. It flowed 7,056 b/d from a thick Eocene pay section, and is the sixth well completed in the field. The oil varies from 34 to 36 gravity.

WELLS DRILLING ON NEW CONCESSIONS IN VENEZUELA

(As of July 1, 1959)

Company	Parcel	Well	Depth	Status
Lake Maracaibo:				
Mene Grande	2055	6-Y-6	15341	Logging
Mene Grande	2068	11-Y-9	10579	Drilling
Phillips	15005	LSG-5-7	14728	Drilling
Phillips	11016	LPG-16-9	13021 FD	7056 b/d
Phillips	11014	LPG-14-10	10665	Drilling
Shell	1023	VLE-3.5X	13928	Drilling
Shell	1019	VLE-310X	11641	Drilling
Shell	10000-47	VLD-311	11131	Cementing
Shell	10000-40	VLD-312	9960 FD	Completed
Shell	10000-40	VLD-313	8668	Drilling
Signal	3005	Centro 17X	12276	Drilling
Signal	3021	Centro 18	12550 FD	Testing
Signal	3016	Centro 19	12560 FD	Testing
Sun	4002	SVS-30	8195	Drilling
Sun	4002	SVS-31	7066	Drilling
Superior	10001-43	Lama-24	9815 FD PB	Abandoned
Superior	10001-41		8041	
Superior	10001-41	Lama-25A	1874 (8567)	Sidetracking
	Gulf of Paria:	Lama-26	1741	
Paria Opns	9100	POSA-100-A-1	4350	Coring
	Barinas:			
Creole	BARI 5-5	Capitanejo 2	12697	Sidetracking
King-Mill	BARI 5-13000	Socopó 2	13375	Drilling
	South Monagas:			
Creole	MONA 5-59A	Jobo Norte 2	4704	Drilling

Middle East

Exploratory drilling has been intensified and the pace will rise throughout the year. The Abu Dhabi offshore discovery was the most important and that find is rapidly being defined by step out wells. It is the farthest south of any commercial production in the Persian Gulf and therefore significant. Offshore wells will blossom off Iran's coast shortly when Pan American hits its stride with its new offshore movable platform that recently completed a perilous trip across the Atlantic from the United States towed by a tug.

Abu Dhabi: British Petroleum has an offshore test running to delineate its discovery at Umm Shaif, made last year. The first well was a producer at below 8,000 ft. No. 2 was about 2 miles west and also reportedly a good producer.

Iraq Petroleum Co. is testing Murban No. 2, which appears to be a commercial discovery at about 2,000 bbls/day from two zones. It is at Tarif, 5 miles south of Murban No. 1 which had substantial shows in 1953.

Afghanistan: The Soviets, in cooperation with Romania and Czechoslovakia, are carrying out exploratory drilling in northern Afghanistan. They have set up the first deep drilling rig at Sar-i-Pul. Another rig is being used at Shibirghan.

Bahrain: A deep test, slightly over 7,000 ft, was completed recently on the Buri structure. It was dry in the objective formations and no wildcats are now drilling.

Egypt: No major exploratory strikes are reported, but drilling is going on by Eastern Petroleum Co., 51% owned by the government. The company is believed to be concentrating on development rather than exploration, but it is drilling offshore in the Red Sea on the new concession granted recently there and several discoveries have been reported.

Egypt has granted an Iranian-Egyptian oil company new concessions for oil prospecting in the next 13 years in Egypt's Sinai desert, including offshore areas of the Red Sea.

Iran: Offshore wildcat drilling will get underway this year on the Pan American and the SIRIP concessions in the Persian Gulf.

The Consortium is planning a new wildcat this year near Bandar Abbas on the Persian Gulf coast opposite Qeshm Islant—first extension of exploration to the eastern end of its operating area in southern Iran. The No. 6 Ahwaz wildcat, which caught fire last year, has now been completed by the Consortium as a "major discovery." Drilled to 13,210 ft, the well tested 34.4 gravity oil at the rate of 15,800 b/d, with high flowing pressure, from a 130-ft section of Asmari limestone.

The Kuh-i-Binak well has found noncommercial quantities of 27-gravity crude in the Asmari limestone at 5,000 ft. Drilling is now being continued at 10,822 ft (as of Aug. 14).

Mand 2, an exploratory well 50 miles southeast of Bushire, was spudded June 14 and was at 1,606 ft on Aug. 14. It is having circulation troubles like Binak 1. The Consortium is drilling the well.

Early this year, NIOC found commercial oil at Sarahjeh, 194 km southeast of Tehran, at a depth of 2,450 m NIOC has been active

(Continued on page 98)

World oil demand to exceed 20 million barrels daily in 1959

Business recovery in the USA and continued expansion of demand elsewhere to bring 6.9% increase in oil consumption this year. European use up 10.8%.

World demand for petroleum is expected to increase 6.9% in 1959 to 20,477,100 barrels per day of crude oil and natural gas liquids according to estimates prepared by World Petroleum on the basis of consumption figures from various parts of the world. In most instances reports from distant areas cover the first four months of the year.

The prospective increase of 6.9% or 1,316,100 b/d compares with a growth in demand of 985,000 b/d or 5.1% in 1958.

Western hemisphere consumption is expected to rise 5.1% this year while the eastern half of the world will continue to do almost twice as well with a prospective rise in demand of 9.4%. The eastern hemisphere rise is, of course, from a smaller base but the differential is getting narrower every year. This year 41.2% of the world's demand for oil is in the eastern hemisphere compared with 29.5% ten years ago.

Within the western hemisphere Canada and Latin America continue to increase their use of oil at a faster rate than the United States. Canadian consumption in the first four months was 13% greater than in the same period last year. Oil industry economists do not anticipate that this percentage will hold for the entire year since the Canadian economy accelerated its rebound in the last half of 1958. Taking a conservative view they suggest a rise of 7.5% to 815,400 b/d on a crude equivalent basis. The increase may be considerably better, however.

Continental USA demand is projected at 9,483,000 b/d this year, a jump of 4.6% which is 50% greater than the historic rate of expansion on a long term basis.

Despite their much publicized economic difficulties the largest oil-deficient nations in South America continue to increase their imports and use of foreign oil at an astonishing rate. Argentina now is conducting a drive with foreign aid to increase domestic oil production and at the same time is expanding its use of oil at nearly 11% this year. Brazil still continues to hunt oil on a "do it yourself" basis without outstanding success while the nation uses petroleum at a pace which expands more than 9% per year.

Other Latin American nations with a growth rate this year above the average for the area are Bolivia, up 8.2%; Cuba, up 9.1%; The Guianas and Surinam, up 8.5%; Haiti, up 9.5%; Peru, up 9%; and Porto Rico, up 7.5%.

In the Eastern Hemisphere Europe continues to be the star performer with an expected demand for three and a half million barrels daily in Western Europe and 2.6 million barrels daily in the Communist Zone. Communist domestic demand is forecast at 11.6% more than in 1958 while the rate of growth in capitalist countries probably will be 10.6%.

The United Kingdom turned in an unprecedented report for the first quarter showing an increase in demand of 20%. April was not quite so spectacular but economists for companies marketing in Great Britain

ESTIMATED WORLD CONSUMPTION OF PETROLEUM PRODUCTS

(Crude-Equivalent Basis [1] Thousands of Barrels Daily)

	1958 MB/D	1959 MB/D	% INCREASE
WESTERN HEMISPHERE			
Alaska & Hawaii	48.0	50.0	4.2
Canada	758.5	815.4	7.5
United States (Continental)	9,065.0	9,483.0	4.6
Mexico	271.9	285.9	5.1
TOTAL NORTH AMERICA	10,143.4	10,634.3	4.8
Latin America			
Argentina	253.4	280.5	10.7
Bermuda	3.2	3.3	3.1
Bolivia	6.1	6.6	0.2
Brazil	228.8	250.8	9.6
Chile	45.8	50.9	11.1
Colombia	55.2	59.3	7.4
Costa Rica	3.9	4.1	5.1
Cuba	74.8	81.6	9.1
Dominican Republic	6.9	7.1	2.9
Guatemala	7.9	8.3	5.1
Ecuador	9.5	10.0	5.3
Guianas	5.9	6.4	8.5
El Salvador	3.7	3.9	5.4
Haiti	2.1	2.3	9.5
Honduras	2.9	3.1	6.9
Jamaica	11.9	12.6	5.9
Netherlands West Indies	136.0	136.7	0.5
Nicaragua	3.6	3.8	5.5
Panama	21.6	22.4	3.7
Paraguay	1.5	1.6	6.7
Peru	44.4	48.4	9.0
Puerto Rico	36.0	38.7	7.5
Trinidad & Tobago	35.2	35.8	1.7
Uruguay	30.0	31.3	4.3
Venezuela	162.0	169.0	4.3
TOTAL SOUTH AMERICAN & CARIBBEAN	1,206.4	1,294.2	7.3
TOTAL WESTERN HEMISPHERE	11,349.8	11,928.4	5.1
EASTERN HEMISPHERE			
Europe			
Austria	45.6	49.6	8.8
Belgium & Luxembourg	155.7	162.6	5.1
Denmark	85.7	93.6	9.2
Finland	34.5	37.0	7.3
France	483.7	520.5	7.6
Germany (West)	428.1	504.9	17.9
Gibraltar	6.4	6.6	3.1
Greece	37.3	40.9	9.7
Iceland	6.4	6.8	6.2
Ireland (Eire)	25.2	26.9	6.8
Italy	329.5	369.7	12.2
Netherlands	197.6	216.0	9.4
Norway	63.0	65.7	4.3
Portugal & Islands	32.4	32.9	1.5
Spain	108.8	115.7	6.3
Sweden	202.0	217.7	7.8
Switzerland	64.2	66.8	3.1
United Kingdom	734.0	837.5	14.0
Yugoslavia	23.5	23.7	7.9
USSR and Satellites	2,350.0	2,623.0	11.6
TOTAL EUROPE	5,556.0	6,157.4	10.8

	1958 MB/D	1959 MB/D	% INCREASE
Africa			
Algeria	32.9	34.0	3.4
British West Africa	15.3	16.8	9.8
Belgian Congo	9.4	9.8	4.3
Canary Islands	62.2	62.5	0.5
Ethiopia & Somaliland	12.5	12.7	1.6
Egypt	88.6	95.8	8.2
East Africa	23.6	24.5	3.8
French West Africa	40.9	43.1	5.4
Ghana	7.8	8.1	3.8
Libya	4.3	4.6	7.0
Morocco	19.9	20.2	1.5
Portuguese West Africa	12.6	13.3	5.6
South Africa (Union of)	95.5	100.6	5.3
Sudan	8.4	8.8	4.5
Tunisia	7.2	8.8	22.2
TOTAL AFRICA	475.0	499.2	5.1
Middle East			
Aden	71.0	72.2	1.7
Bahrain	28.0	29.2	4.3
Iran	112.1	120.5	7.5
Iraq	37.1	36.4	-1.9
Qatar	2.0	2.2	10.0
Israel	32.0	35.0	9.4
Kuwait	52.0	57.0	9.6
Saudi Arabia	59.1	61.2	3.7
Jordan	3.9	4.1	5.1
Lebanon	13.7	16.5	20.2
Syria	14.6	18.8	28.7
Turkey	34.7	37.0	6.6
TOTAL MIDDLE EAST	460.2	490.1	6.5
Far East and Oceania			
Australia	203.0	214.6	5.7
Burma	8.2	8.8	7.3
Ceylon	18.1	18.6	2.8
China	86.0	90.0	4.7
Hong Kong	20.5	21.4	4.4
India	136.0	144.0	5.9
Indonesia	84.0	90.0	7.1
Japan	340.0	363.0	6.8
Korea (South)	10.9	13.4	22.9
Malaya	74.6	76.9	3.1
New Zealand	36.8	37.2	1.1
Pakistan	41.0	41.0	—
Philippines	50.0	51.0	2.0
Thailand	19.9	22.6	13.6
Taiwan	15.7	17.1	8.9
Vietnam, Laos, Cambodia	13.6	15.2	11.7
TOTAL FAR EAST & OCEANIA	1,320.0	1,400.0	6.1
TOTAL EASTERN HEMISPHERE	7,811.2	8,548.7	9.4
WORLD TOTAL[2]	19,161.0	20,477.1	6.9

[1] Includes natural gas liquids and refining and marketing losses.

[2] Includes estimate of military liftings not shown as domestic consumption in some countries.

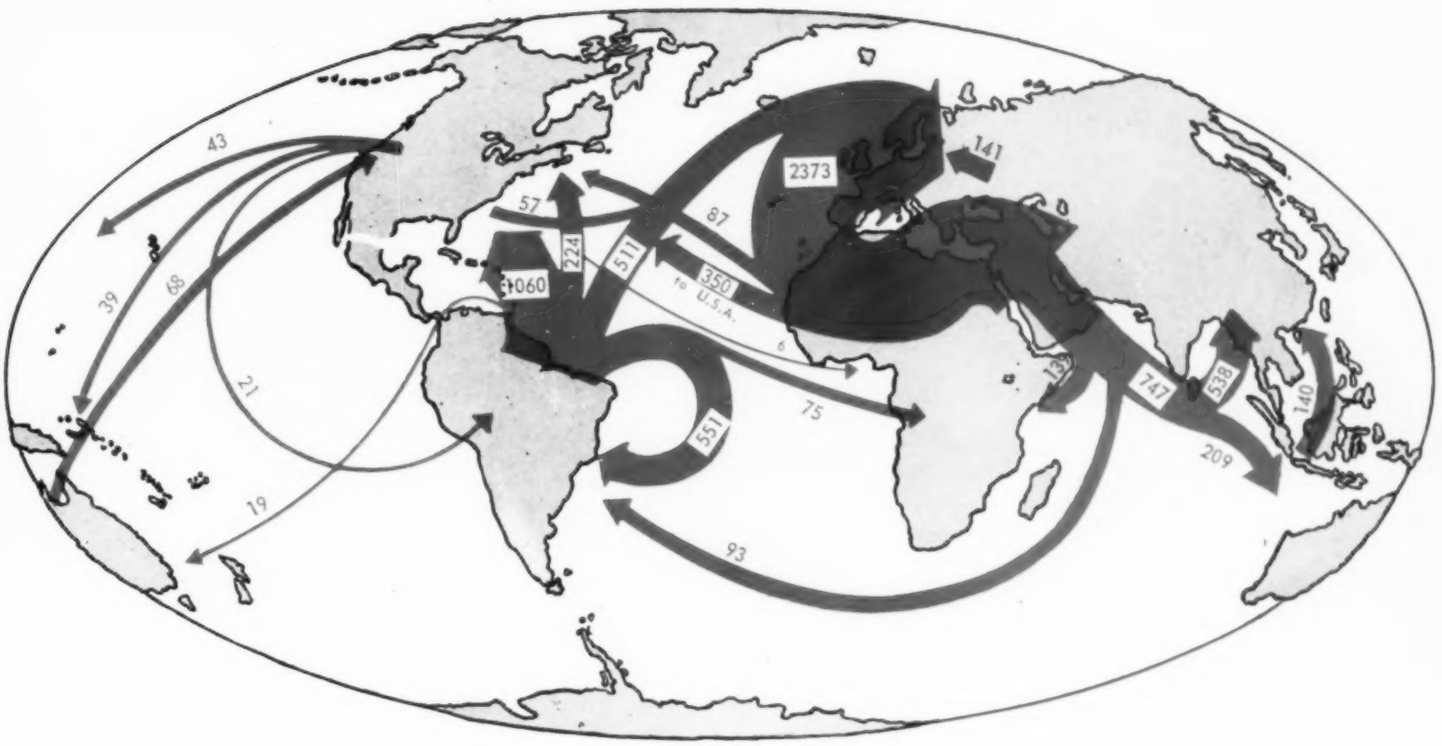


Chart indicating principal intercontinental movements of petroleum and products in 1958. Figures indicate approxmate shipments in thousands of barrels daily. Arrows are not intended to show route followed, only origin and destination continents.

suggest that demand for the year may reach 837,500 b/d, an increase of 14% over 1958. If this level is reached the UK will take over third place among consuming countries from Canada, the USA and USSR being the two largest oil consumers. Canadian demand is forecast at 815,400 b/d, 22,100 b/d below the UK whereas in 1958 Canadian consumption was 24,500 b/d greater than in the UK. Much of the expansion in oil consumption in Britain is to be attributed to the growing use of oil as fuel for power plants to replace coal.

On the continent Germany continues its amazing industrial growth which is paralleled by a similar rise in fuel oil demand. Present outlook is for an increase in oil use of 17.9% to more than a half million barrels daily, only about 16,000 b/d below France.

The French economy shows a healthy growth of 7.6% to 520,500 b/d but probably will yield second place to Germany in 1960 as the largest oil consumer in Western Europe. One reason for this, of course, is the rapidly increasing production of natural gas in France. The huge Lacq field is expected to supply a larger share of French energy requirements year by year for some time to come.

There do not seem to be any really soft spots in Western Europe with the exception of Portugal where a very minor growth is anticipated this year.

Growth of oil demand in Africa still is rather small. The rise this year is expected to be less than 25,000 b/d or 5.1%. Largest consumers are the Union of South Africa using 100,600 b/d, up 5.3% over 1958 and Egypt at 95,000 b/d, up 8.2%.

Eastern Mediterranean countries near Egypt also are enjoying a good year. Syria is expected to show an increase of 28.7% and Lebanon 20.2% although the volume is small in each case, 2,200 b/d in Syria and 2,800 b/d in Lebanon. Israel will show a growth in demand of 9.4% which, on a volume basis, is only 3,000 b/d. Iraq consumption has been adversely affected by political disturbances. In the Middle East as a whole demand is expected to rise 6.5% or roughly 30,000 b/d to 490,100 b/d.

Asian demand is increasing at about the same rate as the Middle East, 6.1%. Present indications are that the explosive postwar expansion in Japan is leveling out. Consumption this year is forecast at 363,000 b/d, a rise of 6.8%. Indian demand probably will be 5.9% higher and Australian 5.7% greater.

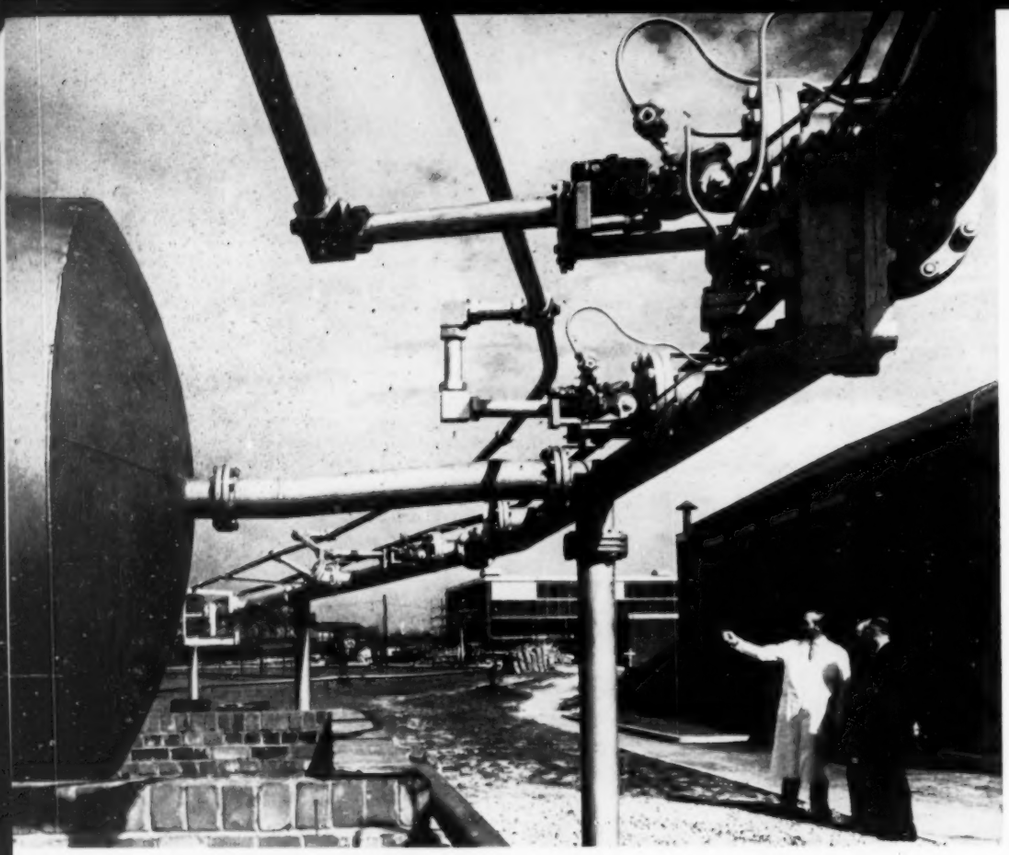
Considerable shifts are taking place in intercontinental movements of petroleum as depicted in an accompanying chart showing estimates for 1958. The outstanding change is in the flow of oil from the Caribbean. This is partly due to the aftermath of the Suez crisis but a strong underlying reason is the change in delivered costs of crude oil in various world markets brought about by softness in the Middle East crude markets. This was apparent even before Venezuela costs became higher as a result of the increase in taxes levied on producers. Working in favor of Venezuela is the larger percentage of fuel oil in most crudes but many of the newer European refineries are being designed to produce minimum yields of light products and maximum residual and middle distillate fuels.

In 1958 the movement of petroleum from the Caribbean to Europe dropped about 140,000 b/d. Deliveries to Africa also were lower but by only about 40,000 b/d.

As mentioned earlier oil-deficient nations in South America have been enjoying a booming oil business and this has been helpful in maintaining an outlet for Caribbean crude. Shipments to southern South America increased nearly 50,000 b/d in 1958 and the trend is continuing again this year.

There was not a great deal of change in shipments from the Caribbean to the USA. Normal expansion in this movement was retarded by government restrictions on imports. In the case of Canada there was a loss in shipments of about 66,000 b/d to 224,000 b/d. At the same time Canada increased its imports of Middle East oil by about 47,000 b/d. The Dominion also used a larger proportion of its own domestic crude output.

Middle East shipments to Europe showed the largest gain, part of this being a return to more normal trade routes following the settlement of the Suez crisis. The increase was about 500,000 b/d. This took care of the natural increase in consumption plus the drop in shipments from the Caribbean. END



View of an aircraft fuelling gallery showing aircraft-type valves in postion. A Shell photo.

A final safeguard against aircraft fuel contamination

by Cecil W. Wood

Apart from being directed towards developing airfield fueling equipment to meet the changing demands brought about by the new types of machines, the accent on much of the current work in the aviation section of the Thornton Research Center of "Shell" Research Ltd., is on the possible refueling problems of tomorrow. Modern jet airliners such as the Boeing 707 and the Douglas DC-8, which consume up to 2,000 gallons of fuel an hour, may require uplifts of some 16,000 gallons, necessitating underwing pressure fueling at 1,000 gpm in order to keep ground time to a minimum, and the demands of tomorrow may be at higher levels still.

An opportunity recently to see something of the work going on under the direction of Dr. R. G. Larsen, head of the research center, showed it to fall under three main headings:

1. Fuel cleanliness—one of the major problems that has to be faced because of the greater volume and intake rate likely to be required and one that is particularly important with the growth of jet turbine aircraft.

2. Static Electricity—a problem of no great import at the moment but one which might become one of some importance with higher fueling rates.

3. Research under the general heading of "hydrant fueling systems" under which heading can be included the question of shock pressures.

Fuel Cleanliness. Even minute quantities of exceedingly fine solids in an aircraft fuel when related to very large intakes can result in the introduction of large total amounts of solids into the engine's fuel system. The aircraft is therefore protected by settling and filtration of the fuel at different stages in its path from the refinery to the aircraft and by microfiltration prior to and during fueling.

In order to help manufacturers to attain the very high standard of filtration required Thornton maintains close technical contact with them during the development of new equipment. New ideas are evaluated and advice offered with a view to improving performance of existing filter units. The aims of the future are to remove much more of the dirt at the very low sizes of one to two microns than is now possible, and also to approach the condition of a complete cut off at a fairly low size in the region 20-30 microns.

Filter manufacturers without adequate research facilities are glad to make use of those at Thornton and prototypes of several new designs were seen being studied under standard conditions in a special test rig. In this way, by the use of standardized contaminants, a reliable and comparable evaluation of the "life" of a filter and its ability to stop dirt under various flow conditions can be made.

Arising out of this work on fuel cleanli-

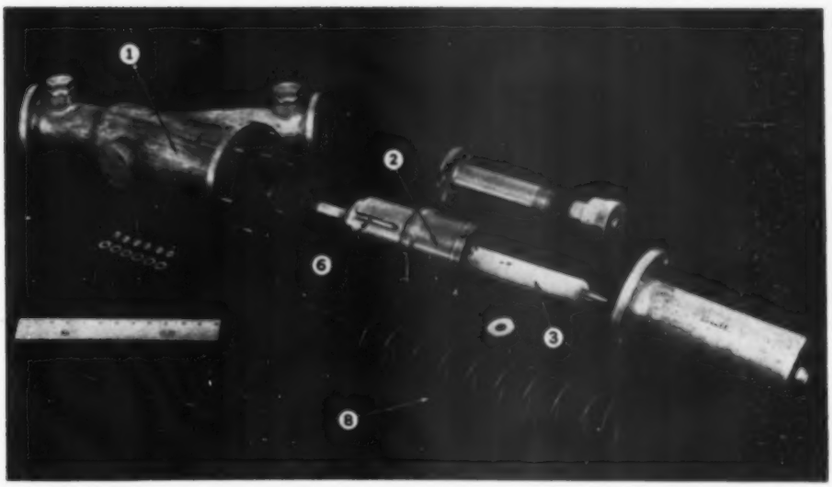


Fig. 1. Component parts of the "Fuel Monitor." (See text for key to numbers.)

ness, a particularly valuable research tool has been developed which has replaced the former visual method of counting microscopic material. This is an application of the Casella electronic particle counter-and-sizer machine. In the Thornton application, this results in an automatic count being recorded of some hundred thousand particles of sizes from less than one micron up. Each sample is traversed several times at different circuit settings to give a very rapid count for different size groups. A complete count of a sample of dirt now takes only about an hour, excluding computing time and slide preparation. So valuable has this new tool proved that a duplicate instrument has been sent to the USA for similar Shell research there. It has proved of great value in helping to assess the dirt-stopping properties of prototype filters. In addition, it is also currently being used in connection with a general review being made of fuel delivery conditions at a number of European airports served by Shell.

Water Contamination. Water contamination of the fuel, which might have potentially serious consequences in service, is prevented by careful handling of the fuel at all stages. One possible safeguard is the use of water separators and an investigation is made of the effectiveness and reliability of these. Standard test procedures have been drawn up in which water is injected into the fuel in a very finely divided form. The requirement is that no detectable free water shall exist in the effluent from such equipment. In this connection a useful device—the Shell Detector—has been developed which gives an airfield fueling operator a positive indication from a 5 ml sample whether free water is present. A small pad at the base of the piston sampler changes color if 30 ppm or over of free water are present and this device is now in very widespread airport use.

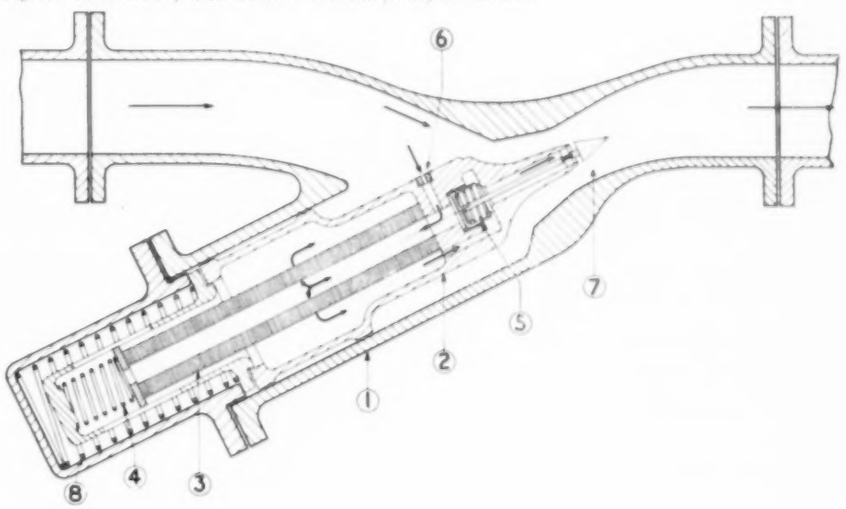
Static Electricity. No trouble with static electricity has been experienced in Shell's fueling operations so far, but it is felt there is a possibility that problems could arise with higher rates in the certain cases in the future and for this reason the whole question is under investigation. A standardized test rig is in use at Thornton in which the amount of static charge built up under varying flow conditions can be measured very accurately. One interesting line of research is that of overcoming the low conductivity of aviation gasoline and turbine fuel by the addition of various "anti-static" additives. Only 2 ppm of the additive is required and by this means fuel conductivity may be so increased that any undue charge developed would quickly leak away to the earthed container.

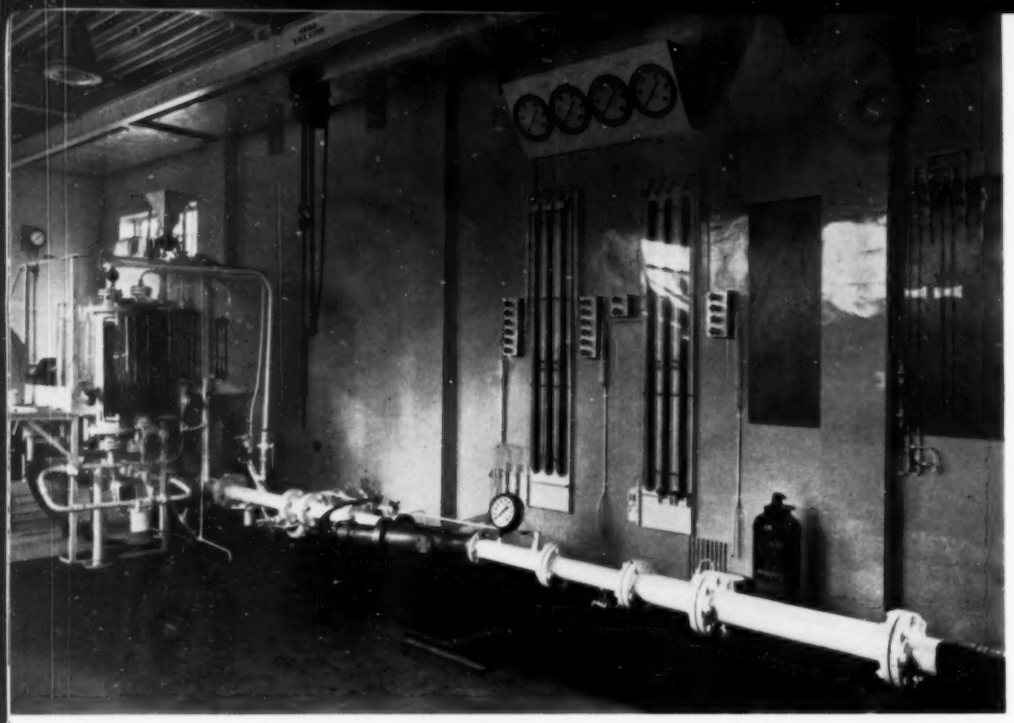
Simulated Hydrant Fueling. Though hydrant fueling has been in use for some years, much research is still proceeding on such specialized components involved as automatic pump controls, pit valves and shock alleviators. This aspect of Thornton's work was demonstrated with the latest Shell dispenser, the "Tagus," capable of 600 gpm fueling. Two such units are used where necessary to fuel a large jet aircraft.

Special attention is being given to the problem of increased hydraulic shock in a pumping system following valve closure at the possible higher fueling rates of the future. Much of the work to date has been concerned with the evaluation and development of special valve control gear for isolating the aircraft system from high upstream surges and the use of pneumatic devices which will increase elasticity of the fluid in the system and so reduce the magnitude of the shock created.

For dealing with this and other related problems, full-scale test facilities with a hydrant system simulating airport conditions have been built at Thornton. This involves a considerable length of pipeline (corresponding to an airport layout) with the relevant pumping and handling equipment. For hydraulic shock work the extent of shock pressure is picked up by pressure transducers in various parts of the system and fed back by electrical pulse to automatic recorders. Thus a complete and permanent record can be secured of the tran-

Fig. 2. Sectional view of "Fuel Monitor." (See text for key to numbers.)





An internal view of the control house of the hydrant rig, showing filtration test apparatus and the Fuel Monitor. A Shell photograph.

sient phenomena in the system, i.e. of the changing shock pressures and the variation in fuel flow rates, valve openings, etc.

A simulated complete Douglas DC-8 fuel gallery was also seen in use at the test site for studying pressure effects with Shell fueling equipment when employing underwing pressure fueling as it is important that excessive pressures are not applied to the aircraft fueling system.

The "Fuel Monitor." Probably the most important development to date in this field of research is the new "Fuel Monitor." This is a fail-safe device for aviation turbine fuel consisting mainly of a valve and a sensitive element installed as near to the aircraft being fueled as possible—i.e. between the microfilter and the delivery hose—which is triggered off and the flow shut down when contaminated fuel passes through it. The sensitive element consists of special filter discs which react physically to the presence of a very small proportion of water, so causing a pressure drop in the system which operates a servo mechanism and leads to an instantaneous cutoff to fuel supply. Numerous safeguards are incorporated in the design, even against neglect of the operator to replace the element after a shutdown.

The components of the fuel monitor are shown in Fig. 1, and Fig. 2 is a simplified diagram to illustrate the principle of operation. The unit comprises a flanged casting having a lateral branch (1) in which is located a piston member. Inside this member (2) is a spring loaded sensitive element (3 and 4) and a small pilot valve (5). In the wall of the piston member is a restrictor orifice (6) through which a sample of the main flow passes. The nose of the piston member extends into the venturi shaped throat (7).

When the system delivery valve is opened the pressure downstream of the piston member is reduced, thus causing a similar reduction in the pressure inside the piston member. The higher upstream pressure reacting on the differential area between the minor and major diameters of the piston member then causes the valve to open. At the same time the higher upstream pressure allows a sample of the flow to pass successively through the restrictor orifice, the sensitive element and pilot valve. It is then discharged via the nose extension into the region of the venturi throat. The size of the restrictor orifice governs the pressure at which the valve will open and the percentage of the main flow taken into the sample. The lower pressure obtaining in the venturi throat assists in drawing the sample through the restrictor orifice and element while the following diffuser section provides pressure recovery and reduces the pressure loss over the complete valve.

When the system delivery valve is closed and flow ceases, the piston member is moved to the closed position as a result of the balance of pressures over the unit. The main spring (8) assists this movement and ensures that the valve remains seated after flow has ceased. The valve is thus exercised every time delivery is commenced or stopped.

In the event of water-contaminated fuel reaching the valve the water content in the sample passing through the restrictor orifice is absorbed by the element, causing the pressure loss over the element to increase rapidly. The higher pressure thus created in the annular space within the element and also behind the piston member reacts on the pilot valve (5) which is thus caused to close, isolating the interior of the piston member from the lower pressure at the venturi throat. In these circumstances the pressure within and behind the piston member will immediately build up until it equals the upstream pressure. The piston member is then subjected to unbalanced pressures and is thus caused to move towards the closed position and flow will cease.

Since valve closure is brought about by increase in the pressure loss over the element, this means that the valve will also shut by particle contamination causing clogging of the element. The unit therefore serves incidentally as a monitor for solid contaminant as well as water.

The device is believed to provide a reliable final check on fuel contamination. Its automatic shutoff will give the operator a clear indication that contamination has occurred and that aircraft and fueling equipment must be checked at every point and remedial action taken according to the evidence obtained.

The fuel monitor has been designed by Shell Petroleum in conjunction with Stream-Line Filters Ltd., and the valves are the subject of patents and patent applications which are jointly held by "Shell" Research Ltd. and Stream-Line Filters Ltd. So satisfactory has the 200 gpm type proved that a number are now undergoing working tests at various airports. These are confidently expected to prove successful and arrangements for manufacture and marketing have been made with Stream-Line Filters. Meanwhile, further development work is proceeding to provide an even finer degree of sensitivity. Included in this work is the production of a unit suitable for flow rates in the order of 600 gpm to meet the requirements of modern large aircraft.

It was clear from this visit to the Thornton Research Center that fueling an aircraft is a far more complicated matter than is generally assumed and that, with the jet airliners of tomorrow, the complications are likely to grow rather than lessen. But at least Shell is not likely to be caught unprepared against sudden unexpected problems. One left Thornton with the feeling that such fueling has become something akin to a new science. END

Petrochemical raw materials for nylon resins: Part II†

by Peter W. Sherwood*

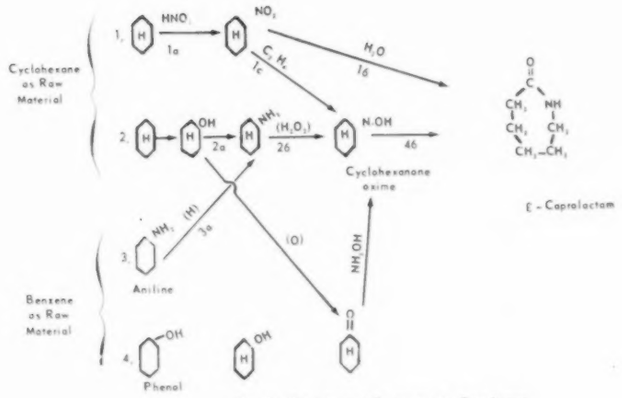


Fig. 3. Petrochemical Routes to ε-Caprolactam

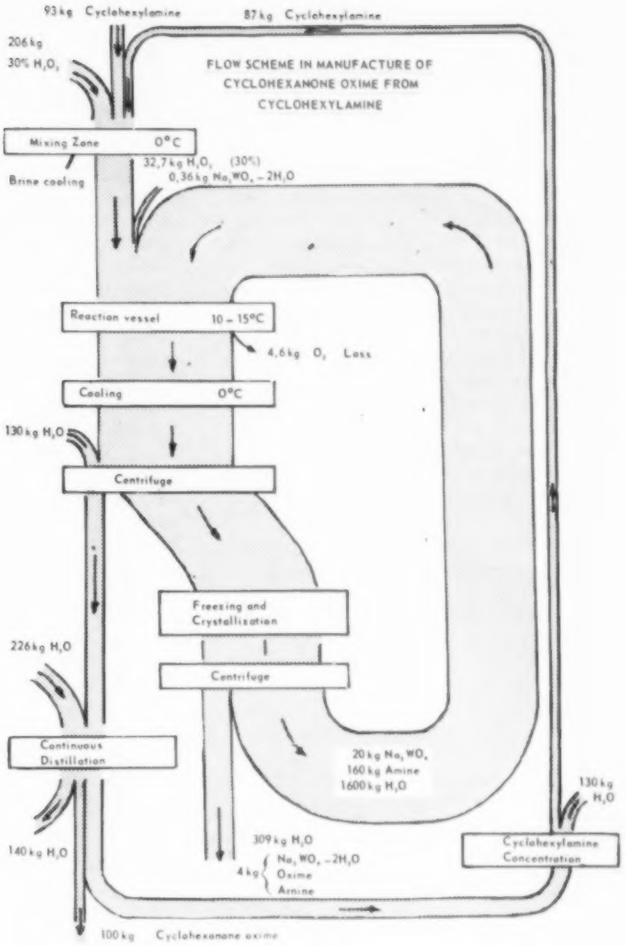
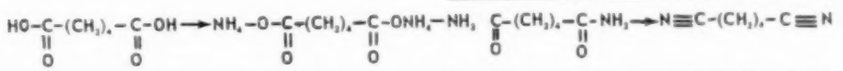


Fig. 4

B. Adiponitrile and Hexamethylenediamine: Adiponitrile is the key intermediate in the manufacture of hexamethylenediamine, one of the two raw materials for nylon-66. Conversion of adiponitrile to HMDA is accomplished by hydrogenation. The synthesis of adiponitrile itself may take one of two paths, starting from adipic acid and from butadiene, respectively. (A third route, starting from furfural is outside the scope of this discussion). Fig. 2 shows the relationships involved.

B-1. Adiponitrile from adipic acid: Adipic acid is converted to adiponitrile by reaction wth ammonia followed by dehydration. Ammonium adipate and adipamide are formed as intermediate products but are not isolated.

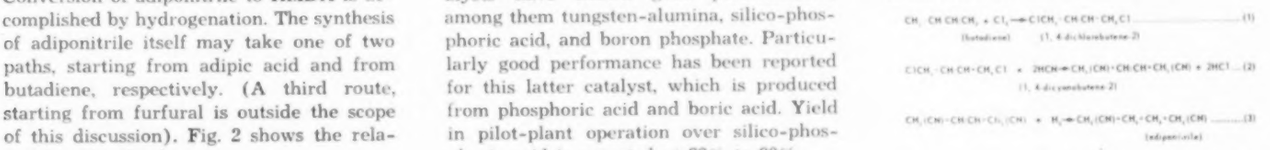


The conversion may be carried out in the liquid phase. In this technique, two stages are employed: reaction of ammonia with molten adipic acid at 200 C to 250 C followed by final dehydration at 300 C. Esters of phosphoric acid serves as catalyst.

Technically important is the synthesis of adiponitrile in the vapor phase. Several catalysts have shown good performances, among them tungsten-alumina, silico-phosphoric acid, and boron phosphate. Particularly good performance has been reported for this latter catalyst, which is produced from phosphoric acid and boric acid. Yield in pilot-plant operation over silico-phosphoric acid is reported at 88% to 90%.

Experience has become available for an early adiponitrile plant. Preheated ammonia and molten adipic acid are mixed in a molar ratio of 20:1. The mixture, at 360 C, is fed to the converter containing the boron-phosphate catalyst as fixed-bed catalyst. Poduct vapors leave the converter at 310 C. They are condensed and enter a distillation column in which recycle ammonia and other light boilers are taken overhead. Crude adiponitrile is withdrawn as bottoms and is refined by distillation.

B-2. Adiponitrile fom butadiene: Three fundamental chemical stages are involved in the production of adiponitrile from butadiene: chlorination of the butadiene to dichlorobutene, nitrilation of dichlorobutene with hydrogen cyanide, and hydrogenation to adiponitrile. The reactions are:


CH2=CH-CH=CH2 + Cl2 → ClCH2-CH=CH-CH2Cl ..... (1)
(butadiene) (1, 4-dichlorobutene-2)
ClCH2-CH=CH-CH2Cl + 2HCN → CH2(CN)-CH=CH-CH2(CN) + 2HCl ..... (2)
(1, 4-dicyanobutene-2)
CH2(CN)-CH=CH-CH2(CN) + H2 → CH2(CN)-CH2-CH2-CH2(CN) ..... (3)
(adiponitrile)

Chlorination of Butadiene: The first essential step in this synthesis leads to an isomeric mixture of dichlorobutenes, together with some higher chlorinated products. The immediately desired product is, of course, 1,4-dichlorobutene-2. Another isomer, 3-4-dichlorobutene-1, which is formed in the reaction, is also a useful intermediate.

This synthesis involves addition chlorination. Since high temperatures favor substitution halogenation, the reaction is advantageously carried out at moderate levels, and operation at temperatures as low as —20 C has been proposed.[4] Very high yields of isomeric dichlorobutenes were obtained by Muskrat and Northrup, who chlorinated butadienes at low temperatures in the liquid phase, using chloroform as diluent.

†Part I appeared in World Petroleum Annual Refinery Review, July 15, 1959, page 59.

*Chemical Engineer, White Plains, N.Y.

A practicable method, which will provide yields of 75% to 78% of theory, is vapor-phase chlorination at temperatures where water cooling is still effective. This technique has been carefully investigated by Commercial Solvents Corp.[5] among others. The reaction is carried out noncatalytically.

Performance is significantly affected by the chlorine:butadiene ratio. In the temperature range 65 C to 75 C, an optimum yield of 78.9% (based on butadiene) was obtained with a feed mole ratio of 1.12. By contrast, a ratio of 0.92 gave a yield of only 62.4%, and efficiency dropped to 65.0% at a chlorine-butadiene ratio of 1.33. In each case, useful conversion per pass is somewhat lower than ultimate yield.

A marked decrease in dichlorobutene formation occurs as the temperature is raised. A reaction system which showed a 70% yield of the desired products at 70 C to 75 C gave only a 15.6% efficiency at 135 C to 140 C.

Due to their much higher boiling points, the chlorinated products are readily separated from the reactants. Fractional distillation gives yield of the isomeric dichlorobutenes in a state of sufficient purity for commercial conversion to dicyanobutene.

Production of Dicyanobutene-1,4: Dicyanobutene-2, the desired nitrilation product of dichlorobutene, was first prepared from this intermediate during the early 1940's by reaction with sodium cyanide. A look at equation (2) shows, however, that the desired conversion involves dehydrohalogenation as well as nitrilation. The use of highly alkaline media tends to promote the former of these reactions without regard to the progress of nitrile formation. Yields obtained under such conditions are therefore, of the order of 20% with the simultaneous formation of large amounts of byproducts (notably cyanoprene).

It was this realization which led to the commercially successful nitrilation of dichlorobutene in moderately acidic media (pH 4-6), which permits yields exceeding 80% of theory. The nitrilating agent in this important operating method is hydrogen cyanide. An acceptor base must be provided to allow for the absorption of hydrogen chloride *in situ*. The dual demands of maintaining an acidic condition throughout the reaction progress and of minimizing hydrogen-cyanide absorption by the acceptor are best served by using an insoluble salt, and calcium carbonate is preferred. An excess of calcium carbonate is employed to insure complete absorption of evolved hydrogen chloride.

The nitrilation reaction pogresses satisfactorily even in the absence of a catalyst. Sufficient reduction can, however, be effected in the required contact time by the use of copper and its salts (notably cuprous chloride) to make their use as catalysts worthwhile. The amount of catalyst is not too critical, but should be at least 0.1 mole-per cent (based on dichlorobutene) in the case of cuprous chloride, and is preferably between 0.5 and 2.0 mole-per cent.

If the operation is carried out in the absence of a solvent, a highly viscous phase is obtained which tends to interfere with smooth progress of reaction. The use of diluents is, therefore, quite essential.

The total amount of HCN fed to the system is slightly in excess of stoichiometrical requirements (namely two moles per mole dichlorobutene).

Operating the reaction in aqueous medium, Farlow[6] employs liquid hydrogen-cyanide feed and an overhead condenser which refluxes unused hydrogen cyanide directly to the reaction vessel. The initial feed to the reactor consists of 2,000 parts water, 15 parts cuprous chloride, 3 parts copper powder, 3.6 parts concentrated hydrogen chloride, and 6.9 parts potassium chloride.

After the mixture has been heated to 80 C, 525 parts finely powdered calcium carbonate is introduced together with an additional 1,000 parts water. With vigorous agitation, the temperature is now raised to 95 C.

The two principal raw materials are added jointly as a mixture of 625 parts dichlorobutene and 308 parts liquid hydrogen cyanide. Throughout the reaction, the temperature is carefully controlled at 95 C.

Upon completion of the reaction, the liquid product is cooled to 60 C, at which point a small amount of organic solvent (chloroform) is added to prevent crystallization of dicyanobutene. Following further cooling to 25 C, the system is extracted with a large volume of organic solvent and separated from the aqueous phase.

A topping step removes the solvent, and final purification is achieved by fractional distillation. Farlow claims a yield of 509.5 parts dicyanobutene (i.e., 95.9% of theory).

Hydrogenation to Adiponitrile: This is the last step in the synthesis of adiponitrile from butadiene. The reaction [equation (3)] may be carried out either in the gas phase[7] or, in the presence of a solvent, in the liquid phase.[8] Of many catalysts which have been investigated, only palladium appears to have the high activity and selectivity which are required for commercial execution of the process.

Gas-phase hydrogenation of dicyanobutene is carried out at atmospheric pressure and at temperatures which preclude condensation of reactant or primary product on the catalyst. The preferred operating range is 250 C to 300 C. The catalyst consists of palladium on a carrier such as charcoal.

For completeness of vaporization and reaction, hydrogen is used in a ratio of 10 moles per mole dicyanobutene. Unused hydrogen can be recycled after separation from the reaction products.

Conversion to adiponitrile is nearly quantitative, and the product requires little or no purification. The only impurity likely to be present in significant quantities is unconverted dicyanobutene.

Supported palladium catalyst is also employed in the liquid-phase hydrogenation of dicyanobutene. Here, too, a continuous process over a fixed-bed catalyst is suitable. Space velocities of 0.3 to 0.6 volumes dicyanobutene per hour per volume catalyst (containing about 2% palladium) are employed to advantage.

Elevated pressures (200 to 500 psig) are required, while the operating temperatures of 75 C to 150 C are considerably below those in the gas-phase process. An improvement in conversion can be shown at the higher temperatures within the indicated range.

At optimum conditions, yields in the range of 95% to 97% of theory can be obtained in the liquid-phase process. Satisfactory catalyst activity after a life of at least 300 hours has been reported. Catalyst regeneration is possible in a stream of hydrogen at 350 C to 650 C.

C. Hexamethylenediamine—

C-1. From adiponitrile: Adiponitrile is hydrogenated to hexamethylenediamine in the liquid phase over cobalt-based catalysts. The conversion is carried out in the presence of both hydrogen and ammonia. Use of ammonia is called for in order to suppress the formation of byproduct hexamethylenediamine.

A continuous process developed by Du Pont[9] employs a fixed-bed cobalt-copper catalyst. Reactor feed is a mixture of four parts (by weight) anhydrous ammonia and one part adiponitrile, plus a large excess of hydrogen. Conversion is effected at 100 C to 135 C and at 9,000 to 10,000 psi, with a space velocity of approximately 0.5 volume adiponitrile per volume of catalyst per hour.

HMDA yield in once-through operation is reported at 90%. This performance can be improved by recycling part of the reaction product.

A key requirement of the process is thorough purification of the feed adiponitrile in order to remove catalyst poisons, notably hydrogen cyanide. Various processes have been reported for effecting such purification by chemical means, e.g., by use of permanganates, or by treating the adiponitrile with SO_2 and aqueous Na HSO_3. In either case, the chemical treatment must be followed by neutralization (by ammonia) and finally by distillation.

C-2. From 1,4-dicyanobutene: 1,4-dicyanobutene obtained from butadiene (*cf.* above) may be converted to HMDA via adiponitrile. Alternatively, the conversion may be carried out in a single hydrogenation stage.

A process for the single-stage conversion has been described.[10] Feed is a 5% solution of dicyanobutene in methanol. This is passed over silica-supported cobalt in the presence of a large excess of hydrogen at 120 C and 9,000 psi. Space velocity is very low (0.1 to 0.15 $hours^{-1}$ dicyanobutene). Yield is reported to be somewhat above 90%.

C-3. From ε-caprolactam: An interesting sidelight is cast on the chemical relationships between nylon-6 and nylon-66 by a hydrogenation process which permits the conversion of caprolactam to hexamethylenediamine in good yield.[11]

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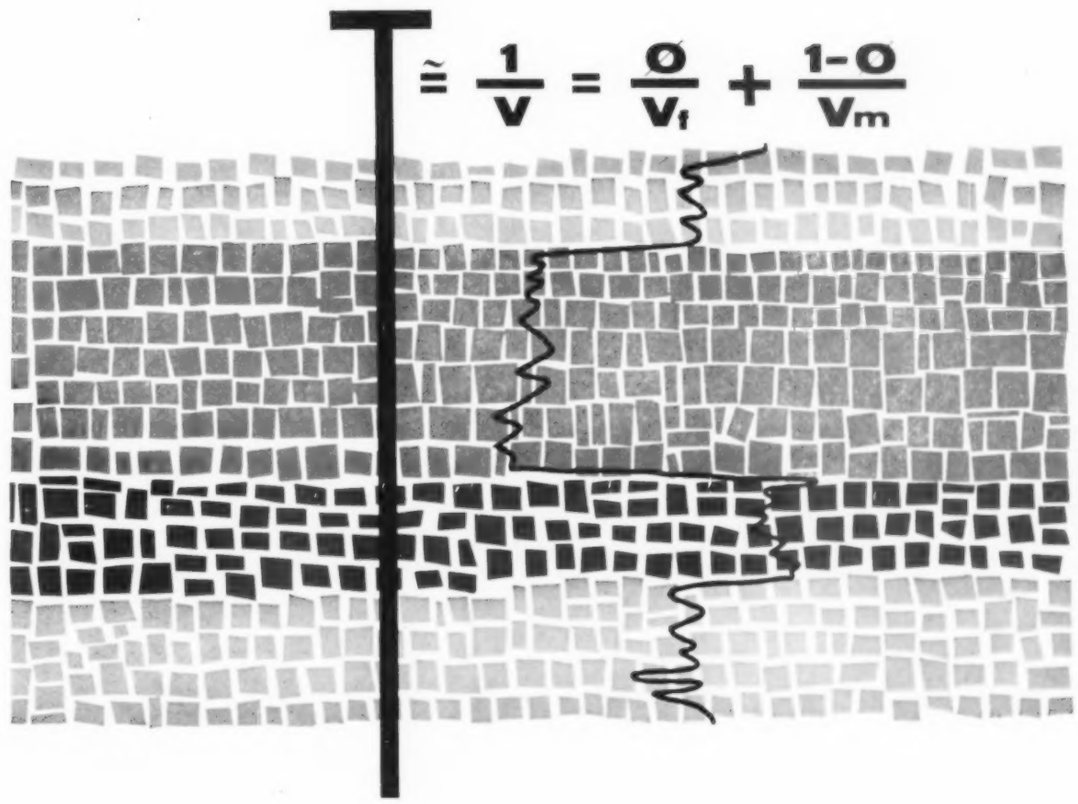

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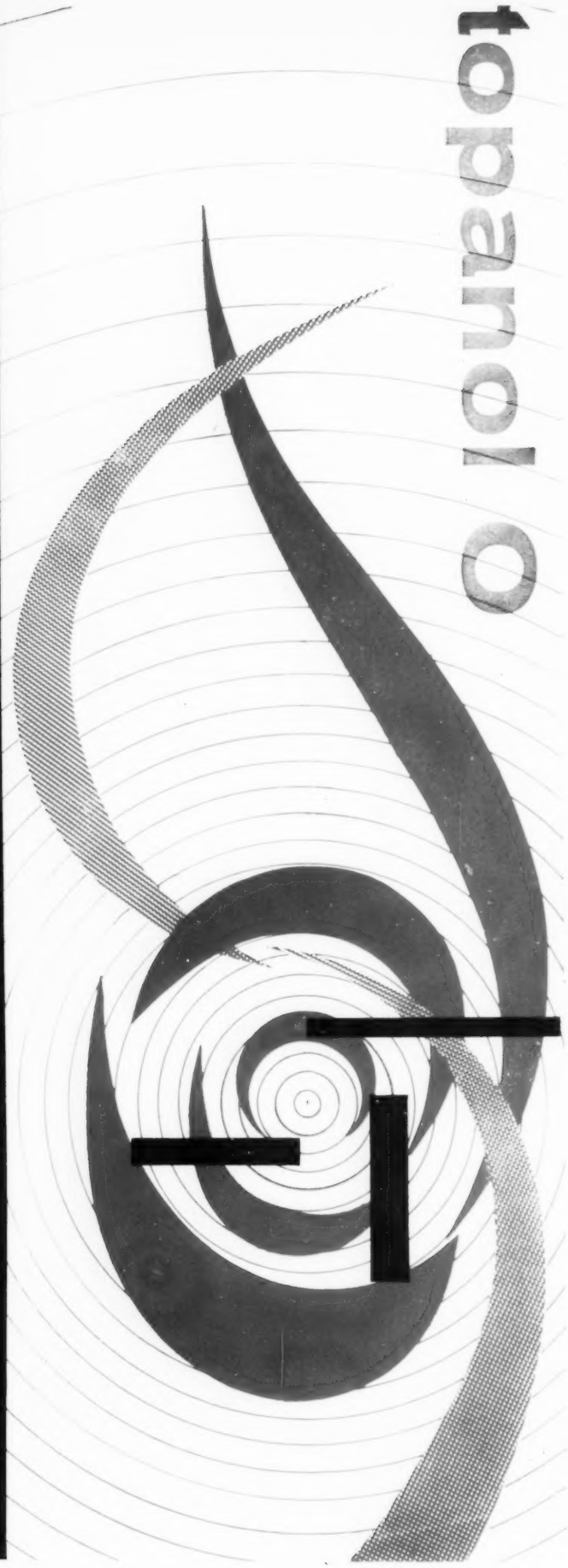


The reaction is carried out over nickel- or cobalt-based catalysts at 225 C to 275 C and in the presence of ammonia. The conversion may be effected in the liquid- or vapor-phase, and this is controlled by ammonia partial pressure. Preferred hydrogen pressure is 2,000 to 3,000 psi.

D. Routes to ε-caprolactam—

Numerous routes lead from benzene and cyclohexane to caprolactam. A general scheme of the relationships involved is shown in Fig. 3. Key conversions in caprolactam synthesis are identified in Fig. 3 by numbers underneath each arrow. The subsequent discussion will provide technical information on how these conversions are carried out.

D. 1a Nitration of cyclohexane: A process for the nitration of cyclohexanes by nitric acid has been described by C. Grundmann and H. Haddenwanger.[12] Optimum performance was obtained with 35% nitric acid, and the best reaction temperature is 120 C to 125 C. Since a liquid phase must be maintained, the system pressure is 60 to 75 psig.

Reaction is carried out continuously with a holdup time of 3 min in the reactor. Low conversion per pass is taken, and liquid product is allowed to settle. The organic phase contains about 80% nitrocyclohexane. Recovery is effected by distillative removal of unconverted cyclohexane followed by caustic extraction and distillation of the caustic-insoluble portion. Yield of about 89 parts nitrocyclohexane and 44 parts adipic acid is reported per 100 parts converted cyclohexane.

D. 1b.—From nitrocyclohexane to ε-caprolactam: Conversion of nitrocyclohexane to caprolactam can be effected in the vapor phase, in contact with a dehydration catalyst. According to England,[13] yield is low but can be boosted somewhat by including an oxidizable material, such as methanol or acetonitrile, with the charge.

Illustrative is the dehydration of nitrocyclohexane in the presence of borophosphoric acid. The reaction was carried out at 375 C with a space velocity of 262 hours^{-1}, and with the addition of two moles methanol per mole nitrocyclohexane. The product caprolactam, isolated by distillation, was obtained in a yield of 35% on nitrocyclohexane consumed.

D. 1c—From nitrocyclohexane to cyclohexanone oxime: An interesting new synthesis for cyclohexanone oxime, developed by BASF, involves reaction of ethlyene with nitrocyclohexanone oxime. The conversion is carried out in the presence of a solvent (e.g., butanol) and a hydrogenation catalyst.[14] The reaction products are cyclohexanone oxime and ethylene oxide. Oxime yield is reported at 70% to 80% of theory.

D. 2a—Cyclohexylamine from cyclohexanol: Good yield is achieved in the conversion of cyclohexanol to cyclohexylamine in the presence of ammonia and hydrogen over foraminate nickel aluminum catalysts[15]. ("Foraminate catalysts" are prepared from alloys from which all or part of one component is removed by acid or alkali treatment. Raney nickel is the most famous example in this category.)

A typical catalyst for the present process is prepared by extracting pieces of a nickel-aluminum alloy containing 42% Ni and 58% Al with 0.2% to 0.4% aqueous caustic to remove at least 20% of the aluminum. The resulting material is washed with water and then impregnated with a 5% solution of barium-hydroxide octahydrate.

Over this catalyst, cyclohexanol was passed together with hydrogen and ammonia in a molar ratio of 1.2:4.8. Reaction was carried out at 200 C and 250 psig, at a liquid hourly space velocity of 0.25.

The liquid product had the following composition:

mono-cyclohexylamine	80% by volume
di-cyclohexylamine	2% by volume
cyclohexanol	2% by volume
water	16% by volume

Conversion was 94%, and the yield 94%, based on cyclohexanol.

D. 2b—Cyclohexanone oxime from cyclohexylamine: Cyclohexylamine can be converted to cyclohexanone oxime by reaction with hydrogen peroxide. The conversion may be carried out in a single step, but substantially better yield can be obtained in continuous operation if it is carried out in two stages: formation of the addition compound of cyclohexylamine and hydrogen peroxide followed by catalytic conversion of the addition compound to cyclohexanone oxime.[16]

Formation of the addition compound is a highly exothermic reaction. This is carried out noncatalytically at 0 C. Conversion is essentially quantitative.

The crude addition product is introduced into a second reaction kettle where conversion to the oxime takes place at 15 C. This second reaction is carried out in the presence of decomposition catalyst. Preferred catalyst is a 1% to 2% aqueous solution of tungsten, molybdenum, or uranium salts (a.g., sodium or ammonium tungstate). The catalyst solution may contain about 10% cyclohexylamine. Heat of reaction in the decomposition stage is quite small.

A flow sheet of the process is shown in Fig. 4. Yield of cyclohexanone oxime is reported at 94% to 95%. Product purity is 99.9%.

D. 3a—Cyclohexylamine from aniline: Aniline is produced from benzene via nitrobenzene and via chlorobenzene. As a standard article of commerce (18¢ per lb), it requires no further discussion in this place.

Hydrogenation of aniline was, at least until 1956, the industrial route to cyclohexylamine. It has been reported that one of the new caprolactam plants now under construction will employ an alternative route to cyclohexylamine in which cyclohexane serves as raw material (q.v.).

A number of catalysts, among them nickel, cobalt and, more recently, ruthenium oxide, have been recommended for the hydrogenation of aniline. Operating temperature is 225 C to 300 C, and hydrogen pressure of 1,000 to 2,000 psi is employed. Based on a study of various nickel- and cobalt-based catalysts, Winans[17] recommends the use of technical cobalt oxide, activated by powdered calcium oxide, as the catalyst which resulted in the smallest amount of byproduct formation.

The hydrogenation of aniline is accompanied by a number of side reactions. Most important within the normal range of operating temperatures is a disproportionation in which cyclohexylamine is converted to dicyclohexylamine and ammonia. Theoretically, addition of either of these products to the feed stream should repress the disproportionation reaction. Actually, Winans finds that addition of ammonia retards or even inhibits the hydrogenation of aniline and is, therefore, objectionable. Addition of dicyclohexylamine, on the other hand, has the desired effect of improving performance. Operating with calcium oxide-promoted cobalt-oxide catalyst and with dicyclohexylamine diluent at 280 C, aniline could be converted to cyclohexylamine in a yield of about 93% of theory.

D. 4a—Conversion of cyclohexanone to its oxime: The organic raw material in this route to cyclohexanone oxime is cyclohexanone. Its synthesis from both cyclohexane and phenol has been described above in our discussion of adipic-acid manufacture (Part I of this article series).

Conversion of cyclohexanone to its oxime is effected by reaction with hydroxylamine sulfate in aqueous solution:

Sulfuric acid, liberated in the process, is neutralized by ammonia.

Information has become available on one commercial batch process for the production of cyclohexanone oxime. Here, a solution of hydroxylamine sulfate, cooled to 20 C, is mixed with cyclohexanone in 5% excess. Ammonia is passed in with vigorous stirring until the mixture becomes neutral. In the course of the reaction, temperature rises to 90 C.

The product is withdrawn to a separator where the oxime settles out as an oily liquid, containing 4% to 5% water. The crude product is used directly as feed to the Beckmann rearrangement reaction stage where it is converted to caprolactam.

D. 4b—ε-Caprolactam from cyclohexanone oxime: The rearrangement of cyclohexanone oxime to caprolactam is catalyzed by strong acids. Sufuric acid is the best-known catalyst for this reaction; it may be used either as such or in the form of anyhydrous SO_3 in various solvents (e.g. in liquid sulfur dioxide or in nitrobenzene).

Very high yield is reported in a process due to Johnson and MacCormack.[18] The method is carried out continuously in a well-stirred reactor containing initially a heel of material from a previous run. In

(Continued on page 104)

Sino-Soviet plans for oil and gas

What chance for success?

by Alexander Gakner*

Alexander Gakner was born in 1922, in Vilno, Poland and in 1931 moved to Riga, then the capital of a free Latvia. He entered the mechanical engineering department of the University of Riga but the German invasion of the Baltic states interrupted higher education, as Gakner and his parents fled from the Germans into the USSR. Caught in the tide of war refugees, the family wound up in Central Asia. Early in 1942 raging epidemics of typhus and typhoid fever took Gakner's parents within a period of six weeks.

Also running from the Germans, the Groznyy Oil Institute moved from the Northern Caucasus to the town of Kokand in Central Asia where Gakner lived. He was admitted to the fall semester in 1942 but less than a year later, the Institute returned to Groznyy and Gakner went with it to the Caucasus. In all he completed three years of study in petroleum engineering at the Institute.

As a former Polish citizen, Mr. Gakner was permitted to leave the USSR in 1946. Traveling through Poland, Czechoslovakia, Hungary, Austria, Switzerland, France, and the United Kingdom, partly on a cloak and dagger basis, he eventually arrived in the United States in August 1947. One month later he was struggling through his first assignment at the School of Mines of Columbia University. Subsequently he won a Henry Krumb scholarship and graduated with a B.S. degree in mining engineering in 1950.

When Mr. Gakner received his United States citizenship in 1952, he accepted the positon of East European specialist with the Division of Foreign Activities of the U.S. Bureau of Mines in Washington, D.C., where he is employed at the present time. Mr. Gakner is the author of numerous confidential government reports on the mineral economy of the iron curtain countries and is a frequent contributor to Bureau of Mines publications. He is a member of the American Institute of Mining, Metallurgical and Petroleum Engineers and serves on the Institute's Committee for Dissemination of Foreign Technical Information. He is Honorary President of the Association of Henry Krumb Scholars of Columbia University.

In 1958 the communist bloc countries together produced 128 million metric tons of crude oil or 14% of the world total. Nearly 90% of it (113 million tons) was produced in the USSR. The growing mineral and metal self-sufficiency of the Soviet Union has, in recent years, enabled that country to increase exports of mineral commodities at a more rapid pace than overall trade. By 1957, nearly 35% of the total exports, by value, were minerals and metals. The greatest gains in the Soviet mineral export trade were made in mineral fuels. Thus, during the 3-year period, 1955-57, the country's exports of crude and petroleum products increased more than 70% by value, while the total value of all exports increased one-quarter.

1. *Trends in petroleum exports.* Production of petroleum in the Soviet Union is growing rapidly, and the country finds itself chronically short of transport, distribution; and storage facilities. Although much is being done to ease this situation through construction of pipelines, storage tanks, and sea-going tankers, the gap between production and consumption of crude and products is widening. This probably explains why the country is increasing its export trade.

The Soviet foreign trade in petroleum (tables 1 and 2) is of a dual nature:

1. Inter-bloc trade.

*The author wishes to express his appreciation to Dr. Kung-Ping Wang, Far East Specialist, U.S. Bureau of Mines, U.S., for his contribution and comments on Communist China.

2. Trade with free world countries.

Within the bloc the Soviet Union is a net exporter of crude oil and until 1957 was a net importer of refined products. As Soviet production of crude and refined products expanded, its shipments to the satellite nations increased. Imports of petroleum products, nearly nine-tenths from Romania in payment for Soviet "assistance," declined substantially, beginning in 1957. In fact, Soviet trade with the satellite nations in refinery products was virtually in balance during that year. Soviet petroleum trade within the communist bloc is summarized in the following tabulation for 1955-57:

	(1,000 metric tons)		
Crude oil	1955	1956	1957
USSR imports	107.7	134.7	207.3
USSR exports	1933.1	2922.7	4212.0
Petroleum products			
USSR imports	3769.0	3798.0	2936.2
USSR exports	1204.7	1244.6	2971.6

In 1958 the USSR agreed (within the Communist Council for Economic Cooperation), to increase its crude-petroleum deliveries to the satellite nations sixfold during the period 1959-65.

On the other hand, Soviet Russia's growing trade with free world nations is dominated by exports of Soviet refinery products, as shown in the following tabulation for 1955-57 (in thousands of metric tons):

U.S.S.R. IMPORTS OF CRUDE AND REFINED PETROLEUM PRODUCTS, 1955 - 1957
(In 1,000 metric tons)

	1955	1956	1957								
	Crude and Products	Crude and Products	Crude Oil	PETROLEUM PRODUCTS: Gasoline	Kerosine	Diesel Fuel	Fuel Oil	Lubricants and Greases	Bitumen and Paraffin Wax	Total Products	Total Crude and Products
FREE WORLD NATIONS:											
Europe: Austria (crude only)	467.10	1375.20	1124.10	--	--	--	--	--	--	--	1124.10
COMMUNIST BLOC NATIONS:											
Albania	153.70	198.80	207.30	--	--	--	--	--	112.20	112.20	319.50
East Germany	226.30	228.00	--	166.90	1.00	15.00	--	3.00	25.10	211.00	211.00
Hungary	61.90	44.20	--	12.10	--	--	--	12.60	1.20	25.90	25.90
Mongolia	--	9.9	--	4.30	--	.40	--	--	--	4.70	4.70
Poland	2.90	15.00	--	--	--	--	--	--	.50	.50	.50
Romania	3131.90	3436.80	--	1839.60	292.60	283.20	57.10	71.90	37.50	2581.90	2581.90
(Communist TOTAL Countries)	3676.70	3932.70	207.30	2022.90	293.60	298.60	57.10	87.50	176.50	2936.20	3143.50
UNACCOUNTED	46.70	.50	--	--	--	--	--	--	--	--	--
GRAND TOTAL	4390.50	5308.40	1331.40	2022.90	293.60	298.60	57.10	87.50	176.50	2936.20	4267.60
Est. Value (in US $1,000)	123,065	137,515	24,290	64,505	7,185	6,925	640	5,625	10,160	95,040	119,330

Crude oil	1955	1956	1957
USSR imports	467.1	1375.2	1124.1
USSR exports	983.1	974.2	1456.3
Petroleum products			
USSR imports	—	—	—
USSR exports	3864.6*	4906.7*	5018.9*

*Estimate

The USSR does not import refined products from free world countries. The only source of crude is Austria, which must deliver to the USSR 1.0 to 1.2 million tons of crude annually until 1965, under the terms of the Austrian State Treaty of 1955. The Soviet Union redistributes the Austrian crude in almost equal shares among Poland, Czechoslovakia, East Germany, and Hungary.

Soviet exports to the free world are supplemented by shipments from other satellite nations. In 1957 (see table 3, these nations exported over 75,000 metric tons of crude oil and over 800,000 metric tons of refinery products to countries outside the communist bloc. More than two-thirds of these shipments originated in Romania, which ranks second to the USSR in petroleum production within the communist bloc.

2. *Current rate of production.* Before World War II the petroleum industry of the USSR developed very slowly. The rigidly planned economic system of the Soviet Union would not tolerate the high degree of risk involved in exploring and drilling for oil. The planners in the USSR, where unfulfilled goals are usually cause for severe punishment, preferred to meet expanding energy requirements from "dependable" coal production rather than to take a chance and expose themselves to the hazards inherent in the search for and development of petroleum resources. The Soviet Union has vast explored coal reserves; and, because of the continuous orientation toward coal, considerably more than half of the energy consumed in the country is derived from that source, in spite of the fact that, by United States standards, the Soviet coal industry is inefficient and coal is an expensive fuel.

Political and economic developments following World War II have greatly altered Soviet philosophy toward petroleum and natural gas. Realization of the strategic importance of oil and its derivatives in time of war as well as peace, growing energy shortages in the European parts of the country, mounting transportation problems, postwar labor shortages, and scarcity of investment capital in the light of ambitious plans for the development of the country's economy have focused Soviet attention on petroleum and natural gas. The Russians have learned to accept the risk and to appreciate petroleum.

After World War II an extensive geological exploration program was initiated, which resulted in large discoveries of crude oil and natural gas. The Soviets claim that since 1946 their "explored" crude oil reserves have increased sixfold and are now the largest in the world, although no basic data to support these claims has been published. Recently disclosed percentage figures on the changing distribution picture of crude-oil reserves in the USSR, when applied to actual pre-World War II reserve tonnages, indicate a crude oil reserve in the Soviet Union of 4.5 billion metric tons. This figure, which is approximately one-third greater than the current estimates of Russian reserves published in USA trade publications (see World Petroleum Report, 1959, Feb. 15, 1959, p. 20), should not be too surprising, as some authorities believe the crude-oil potential of the USSR to be twice that of the United States. The most signficant recent discoveries were made in the area between the Volga River and the Ural Mountains. This district now contains 80% of the country's crude oil reserves and supplies two-thirds of the crude production, which is expanding rapidly.

In the face of advancing German forces during World War II the Russians destroyed some of their oil production facilities in northwestern Caucasus. By the end of 1948, however, production of crude oil reached the maximum prewar rate of about 31 million metric tons (225 million barrels) a year. Subsequently, in the 10-year period 1949-58, production increased 3.5 times to an annual rate of 113 million metric tons (825 million barrels). The growth of natural gas output in the USSR has been equally spectacular. The All-Union Scientific Research Institute for Natural Gas (VNIIGAZ) recently prophesied (the Russians use the term "prognosticated")) that the total natural gas reserve of the USSR may be as high as 20,000 billion cubic meters but admitted that, as of 1958, the

Some evaluations presented in this report necessarily are based on estimates because of the inadequate coverage of mineral statistics in Communist literature. All estimates used are based on extensive study and analyses of pertinent information from Communist and other sources. The author believes that all statements accurately reflect the *order of magnitude* and *trends* in the activities discussed.

EXPORTS OF CRUDE AND REFINED PETROLEUM PRODUCTS FROM SOVIET SATELLITE NATIONS TO FREE WORLD COUNTRIES, 1957
(In metric tons)

Country of Destination \ Country of Origin	Bulgaria	Czechoslovakia	East Germany	Hungary	Poland	Rumania	Total
Crude:							
Belgium-Luxembourg	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	10,000
Syria	—	—	—	—	—	65,748	65,748
TOTAL Crude	—	—	—	—	—	65,748	75,748
Products:							
Austria	27,159	43,747	5,829	46,847	5,119	58,551	187,252
Belgium-Luxembourg	—	—	—	—	—	20,583	20,583
Egypt	—	—	—	—	—	77,859	77,859
Federal Republic of Germany	4,615	39,343	—	27,566	4,068	176,600	252,192
Italy	—	—	—	150	—	152,157	152,307
Morocco	—	—	—	20	—	956	976
Norway	—	22	2	—	—	51,846	51,870
Sweden	—	2,972	—	19,300	20,000	4,400	46,672
Switzerland	—	235	747	445	—	1,523	2,950
Syria	—	—	—	—	—	3,398	3,398
Yugoslavia	—	—	—	449	1,379	3,155	4,983
TOTAL Products	31,774	86,319	6,578	94,777	30,566	559,028	809,042

NATURAL GAS PRODUCTION* IN COMMUNIST BLOC COUNTRIES,
1954 — 58, 1960, 1965, 1970-72
(In million cubic meters)

	1954	1955	1956	1957	1958	1960 Plan	1965 Plan	1970-72 Plan
U. S. S. R.	**8,783	8,981	**13,700	**20,200	**29,800	55,000	150,000	270,000 to 320,000
Romania	3,629	3,972	4,374	4,630	5,300			
China	29	29	30	30	est. 35			
Czechoslovakia	172	173	274	772	est. 1,000	8,500	11,000	15,000
Hungary	556	543	452	413	est. 400			
Poland	358	393	436	419	est. 400			
TOTAL	13,527	14,091	19,266	26,464	est. 36,935	63,500	161,000	285,000 to 335,000

"industrial" (measured plus indicated) reserve is only 5% of that figure.

The increase in the production of crude petroleum and natural gas in the other countries of the Sino-Soviet Bloc has been less spectacular. Tables 4 and 5, which show recent and planned future production of oil and gas in these countries, reveal that, from 1954 to 1958, crude output in the USSR increased 90%, whereas that of the other Bloc countries increased only 26%. The percentage increase in natural gas output for the same periods were 240 and 50, respectively.

3. *Petroleum goals.* According to Soviet sources, the USSR plans to double its 1958 crude-oil output by 1965—the last year of the current seven year plan for economic development of the country—and to triple it by 1970-72. (See table 4.) During the same periods the USSR plans to increase its natural gas production by 5 and about 10 times, respectively. (See table 5.)

A similar rate of growth is not expected in any European satellites. The Romanian petroleum industry is approaching maturity and will at best increase output by about 25 to 30% in the next 7 to 15 years. Natural gas production may expand substantially in Czechosolvakia but not enough to effect a significant shift in the energy balance of that country. The major uncertainty in the future petroleum supply picture of the Sino-Soviet Bloc is China. Recent discoveries of new oil fields, coupled with an all out effort to industrialize the country, may result in a four fold increase of the 1958 crude output by 1965 and, perhaps, as much as twentyfold increase by 1970-72. In 1958 China contributed an estimated 2.3 million metric tons, which was less than 2% of the total crude oil output of the Communist Bloc; it may furnish as much as 10% by 1970-72.

4. *What chance for success?* Available quantitative information on reserves and production and refining capacity does not permit evaluation of the outlook for accomplishment of planned production and consumption objectives for individual regions within the USSR. However, there appears to be little doubt, in the minds of Russia's petroleum authorities, that the goals will be met. There are also sufficient clues to indicate that much is being done in the USSR to assure success of the seven year plan for petroleum. The country's petroleum institute graduate annually a great number of highly specialized geologists, technologists, and engineers. The al-

CRUDE OIL PRODUCTION IN COMMUNIST BLOC COUNTRIES, 1954 — 58, 1960, 1965, 1970-72
(In 1,000 metric tons)

	1954	1955	1956	1957	1958	1960 Plan	1965 Plan	1970-72 Plan	Estimated Conversion Factor bbls/metric ton
U. S. S. R.	59,280	71,000	83,800	98,300	113,000	135,000	230,000 to 240,000	350,000 to 400,000	7.30
Romania	9,741	10,555	10,920	11,200	11,336	13,500	14,000	15,000	7.45
China	790	966	1,175	1,500	2,300	3,000	10,000	40,000 to 45,000	7.25
Albania	175	209	283	491	403				6.65
Bulgaria	5	150	247	285	300				7.35
Czechoslovakia	125	107	108	108	108	2,200	3,000	4,000	6.78
Hungary	1,212	1,596	1,202	675	840				7.65
Poland	184	180	184	181	180				7.40
TOTAL	71,512	84,763	97,919	112,740	128,467	153,700	257,000 to 267,000	409,000 to 464,000	

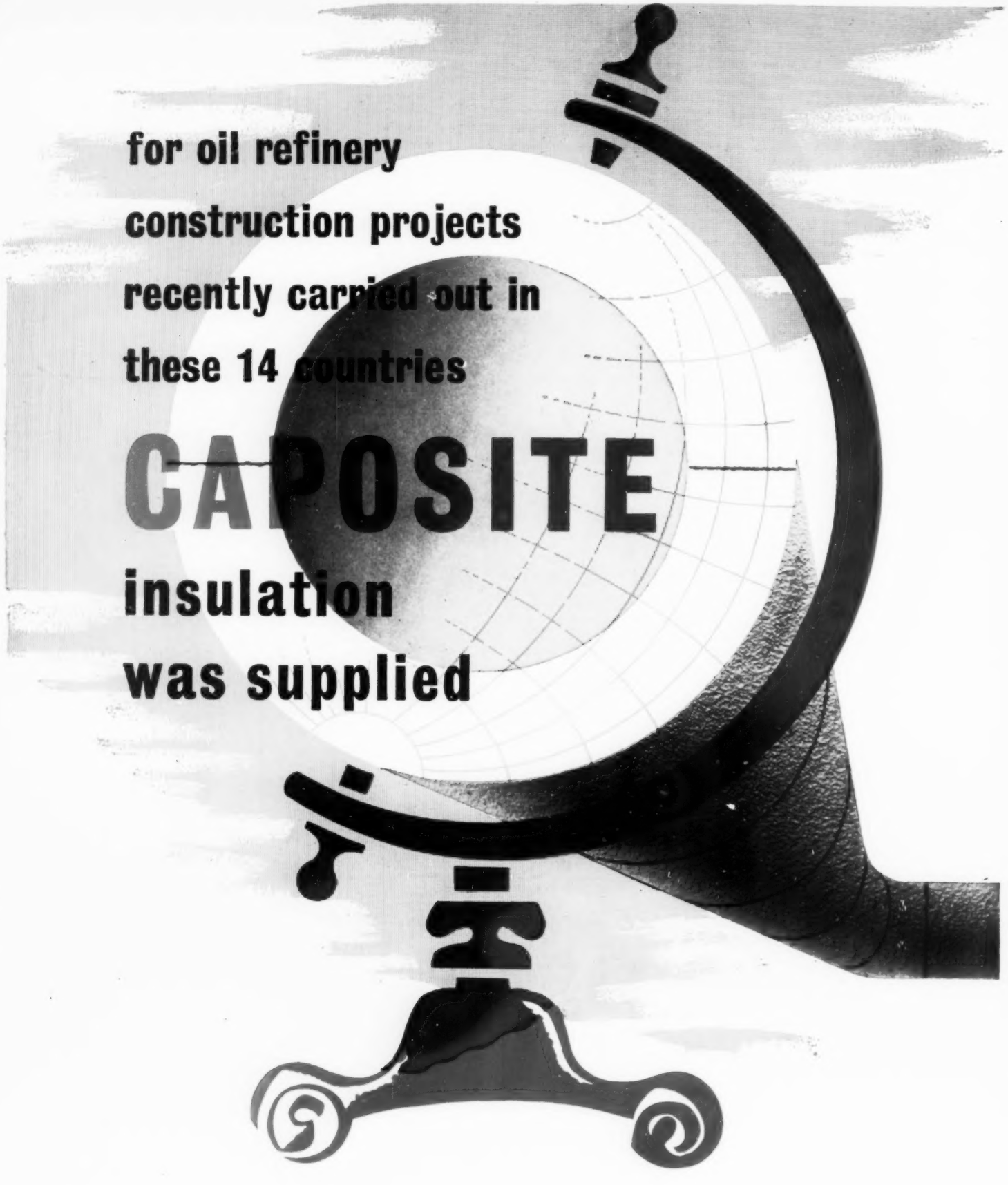
ready effective petroleum exploration program will be expanded some 65% in the next seven years, and Soviet geologists expect that discovery of new reserves will continue to exceed depletion by a wide margin.

Scientific research organizations are continually improving drilling and recovery methods. During the next seven years the primary refining capacity is expected to double; catalytic cracking capacity is expected to increase 4.3 times and catalytic reforming 16 to 18 times. Several thousand miles of new pipelines, including one across the European continent to deliver petroleum to Poland, Czechoslovakia, East Germany, and Hungary, will facilitate transportation and distribution.

Despite these measures, the problems of the petroleum industry may be expected to mount. Jurisdiction over the various programs (exploration, drilling, refining, distribution) is divided among several organizations. This and the new political division of the country into more than 100 economic regions (Sovnarkhozy), each with its own needs and problems, are bound to create substantial discord in the petroleum industry. Thus, while overall goals may be met, balanced expansion of crude production, refinery output, and transportation may not be attained; therefore disposal of surpluses will present a continuing problem. In these circumstances the pipeline to the European satellites will have the effect of a multipurpose relief valve: It will help to satisfy the growing needs of the European satellites and will provide a means of disposing surplus production. To further alleviate the problem of surpluses, it is not inconceivable that the northern branch of the pipeline leading to Poland and East Germany might be extended to the Baltic Sea to facilitate exports to West European countries. It is also possible that, to accomplish the same objective, an independent line entirely within the Soviet territory may be built to a USSR port on the Baltic.

U.S.S.R. EXPORTS OF CRUDE AND REFINED PETROLEUM PRODUCTS, 1955 - 1957
(In 1,000 metric tons)

	1955	1956	1957								
				PETROLEUM PRODUCTS							
	Crude and Products	Crude and Products	Crude Oil	Gasoline	Kerosine	Diesel Fuel	Fuel Oil	Lubricants and Greases	Bitumen and Paraffin	Total Products	Total Crude and Products
FREE WORLD COUNTRIES:											
Europe: Austria	7.00	0.12	--	--	--	--	--	--	0.12	0.12	0.12
Belgium	30.30	30.46	--	--	--	**	0.7	--	.02	.72	.72
Denmark	2.10	.60	--	--	--	0.2	22.0	--	--	22.70	22.70
Federal Republic of Germany	5.30	142.70	--	--	--	441.0	289.6	--	--	745.90	745.90
Finland	612.50	1,011.80	--	270.3	49.7	324.6	374.8	7.8	13.30	1,040.50	1,040.50
France	269.30	408.90	321.8	76.1	--	79.6	73.3	--	.39	229.39	551.20
Greece	94.50	224.10	--	--	65.5	54.6	172.4	--	--	302.50	302.50
Iceland	283.30	258.90	--	40.7	--	163.8	95.3	--	--	299.80	299.80
Italy	183.30	500.40	425.9	--	--	.8	74.8	--	.80	76.40	502.30
Netherlands	10.30	15.06	--	--	--	**	--	--	.20	.20	.20
Norway	35.50	26.10	--	--	--	28.7	117.8	--	.30	146.80	146.80
Sweden	725.60	694.20	--	--	19.6	257.4	258.5	--	.80	536.40	536.40
Switzerland	--	1.20	--	--	--	33.3	95.3	--	--	128.60	128.60
United Kingdom	37.40	26.10	--	--	--	21.7	3.9	28.6	3.20	57.40	57.40
Yugoslavia	208.60	331.70	390.4	13.9	--	1.3	--	--	0.20	15.40	405.80
TOTAL Europe	2,505.00	3,672.34	1,138.1	401.0	134.8	1,407.0	1,578.4	36.4	19.33	3,602.83	4,740.93
Asia: Afghanistan	21.10	27.40	--	21.8	5.2	3.9	.8	.6	2.00	34.30	34.30
Iran	.50	.24	--	--	--	--	--	.3	.02	.32	.32
Lebanon	--	--	--	--	--	10.9	--	--	--	10.90	10.90
Syria	--	26.00	--	--	**	22.1	--	--	--	30.20	30.20
Israel	455.2	363.90	--	--	--	--	--	--	--	--	--
Turkey	.6	5.70	--	--	--	0.7	4.0	--	--	4.70	4.70
TOTAL Asia	477.40	423.24	--	21.8	5.2	37.6	4.8	.9	2.02	80.42	80.42
Africa: Algeria	--	--	--	--	--	52.0	114.3	--	--	166.30	166.30
Egypt	329.50	920.70	318.2	10.4	274.7	124.2	342.7	--	--	745.20	1,072.40
Morocco	--	--	--	--	--	10.0	23.3	--	--	33.30	33.30
TOTAL Africa	329.50	920.70	318.2	10.4	274.7	186.2	480.3	--	--	953.80	1,272.00
TOTAL Free World	3,311.90	5,016.28	1,456.3	433.2	414.7	1,630.8	2,063.5	37.3	21.35	4,626.15	6,082.45
COMMUNIST BLOC COUNTRIES:											
Albania	8.60	11.90	--	--	--	.6	--	4.1	--	4.10	4.10
Bulgaria	118.10	164.96	--	134.8	49.2	165.0	6.8	23.6	1.10	380.50	380.50
China	948.40	1,090.20	380.4	573.1	372.8	380.2	--	95.3	--	1,422.20	1,802.60
Czechoslovakia	540.90	806.40	1,234.8	57.0	--	45.5	--	--	.50	103.00	1,337.80
East Germany	653.40	749.80	1,044.5	--	--	--	--	3.7	--	3.70	1,048.20
Hungary	202.60	345.10	919.2	--	--	--	57.8	3.6	--	61.40	980.60
North Korea	48.30	50.19	--	108.7	4.1	45.0	2.1	19.1	.70	179.70	179.70
Mongolia	60.50	78.40	--	37.3	.3	32.1	--	4.2	.80	74.70	74.70
Poland	663.50	862.80	633.1	311.8	49.9	274.3	50.0	7.2	1.40	694.60	1,327.70
Romania	1.20	4.30	--	--	--	--	--	.9	--	.90	.90
Vietnam	--	3.20	--	23.4	10.6	12.0	--	.8	--	46.80	46.80
TOTAL Communist Countries	3,245.50	4,167.25	4,212.0	1,246.1	486.9	954.7	116.7	162.5	4.50	2,971.60	7,183.60
UNACCOUNTED	1,428.10	864.67	254.9	26.0	6.5	113.2	12.6	2.3	2.75	137.85	392.75
GRAND TOTAL	7,985.50	10,048.20	5,923.2	1,705.3	908.1	2,698.7	2,192.8	202.1	28.60	7,735.60	13,658.80
Est. Value (in US $1,000)	228,700	283,135	132,870	77,745	34,300	86,945	40,125	21,800	2,370	264,715	397,585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CANADA *at Clarkson, Ontario*
for British American Oil Co. Ltd. Main Contractor: The Lummus Co.

COLOMBIA *at Cartagena*
for International Petroleum Co. Ltd. Main Contractor: Bechtel Corporation (Insulation Contractor: Harold Aber & Co.)

ECUADOR *at La Libertad*
for the Anglo-Ecuadorian Oil Co. Ltd. Main Contractor: Procon (G. B.) Ltd.

ENGLAND *at Kent Oil Refinery*
for The British Petroleum Co. Ltd.

FRANCE *at Raffinerie de Normandie*
for Compagnie Francais de Raffinage. Main Contractors: Kellogg International Corporation and Foster Wheeler Ltd. (France). (Insulation Contractor: Soc: Technisol).

IRAQ *at Daura, near Baghdad*
for Iraq Government Oil Refinery Administration. Main Contractor: Foster Wheeler Ltd. (London).

ITALY *at Genoa*
for Raffineria Dottore E. Garrone. Main Contractor: C. T. I. P.

KUWAIT *at Akmadi*
for the Kuwait Oil Co. Ltd. Main Contractor: Bechtel-Wimpey and E. B. Badger & Sons Ltd.

THE NETHERLANDS *at Pernis*
for N. V. de Bataafsche Petroleum Maatschappij.

NETHERLANDS ANTILLES *at C.P.I.M. Refinery, Curacao*
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SCOTLAND *at Grangemouth*
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Sparking sample for spectrographic determination of phosphorus.

Announcing new methods for rapid determination of phosphorus in gasoline

Ethyl Research develops spectrographic and colorimetric procedures

In recent years, phosphorus compounds have been used extensively as gasoline additives to combat surface ignition and spark plug fouling. Indications are that phosphorus deposit modifiers will be even more important in the future. This has created a need for rapid methods to determine phosphorus in gasoline.

Ethyl's Detroit Research Laboratories have developed two analytical procedures to satisfy this need. One of these is spectrographic and the other colorimetric.

Both procedures apply to a wide variety of phosphorus compounds. And they can be used effectively on gasolines containing additives such as tetraethyllead, antioxidants, dyes, and metal deactivators.

Spectrographic Method

Phosphorus concentrations* of 5 to 75 mg. per liter of gasoline can be determined by the spectrographic method with a standard deviation of 0.8 mg. per liter. A single phosphorus determination can be made in 30 minutes; a two-man team can make 70 such determinations per day.

The gasoline is analyzed without pretreatment except for adding a radiation buffer and an internal standard.

The buffer solution, consisting of 60 percent dimethylformamide and 40 percent isopropanol, improves the phosphorus line intensity and also reduces the effects of base stock and additives. Triphenylarsine, added to the buffer as

*Phosphorus concentration is frequently stated as "theories of phosphorus". A theory is the weight ratio equivalent to two atoms of phosphorus to three atoms of lead.

the internal standard, further reduces the effects of variations in sample and additive composition.

An inert atmosphere of argon prevents sample ignition. The argon also enhances the intensity of the phosphorus line.

Analytical curves are plotted to give phosphorus concentrations in units of grams per liter, or as "theories of phosphorus" for a given tetraethyllead concentration.

One curve can be used for samples containing commonly used phosphorus additives. Separate curves are needed for samples containing more volatile phosphorus compounds such as trimethyl phosphate, triethyl phosphate, and dibutyl hydrogen phosphate.

A correction is required for samples containing manganese.

Colorimetric Method

The colorimetric procedure is slower than the spectrographic method but more accurate. It can be applied to gasoline containing from 5 to 50 mg. of phosphorus per liter with a standard deviation of 0.5 mg. per liter. An hour is needed for a single determination; 24 can be made per man day.

The fuel sample is adsorbed on zinc oxide and ignited to oxidize the organic phosphorus. It is subsequently converted to the orthophosphate ion by dissolving in sulphuric acid. In this form phosphorus is readily measured in the presence of zinc, using a molybdenum blue method. Color obtained is stable and reproducible.

Ethyl's experience with a large number of gasolines containing a variety of antioxidants, dyes and metal deactivators has shown that these additives do not interfere with the determination; neither does manganese added to gasoline as (methylcyclopentadienyl)manganese tricarbonyl.

Inserting sample for colorimetric procedure.

Comparison of Spectrographic and Colorimetric Methods

	Spectrographic	Colorimetric
Sample size, ml.	4	1
Elapsed time for one determination; minutes	30	60
Determinations per man-day	35	24
Concentration range, mg./liter	5-75	5-50
Standard deviation, mg./liter	0.8	0.5
Base stock effect	none	none
Phosphorus additive effect	Additional calibration needed for volatile compounds	none
Manganese interference	Correction required	none

How Ethyl Research can help you

Copies of the paper, "Rapid Determination of Phosphorus in Gasoline," presented at the recent API Division of Refining meeting, are available through your Ethyl Representative. It is a detailed description of the analytical procedures outlined here.

The need for rapid methods to determine phosphorus in gasoline has arisen from the widespread acceptance of phosphorus additives as deposit modifiers. Ethyl has available three such additives. Two of these are free from any patent complications. Your Ethyl Representative will be glad to supply you with full details.

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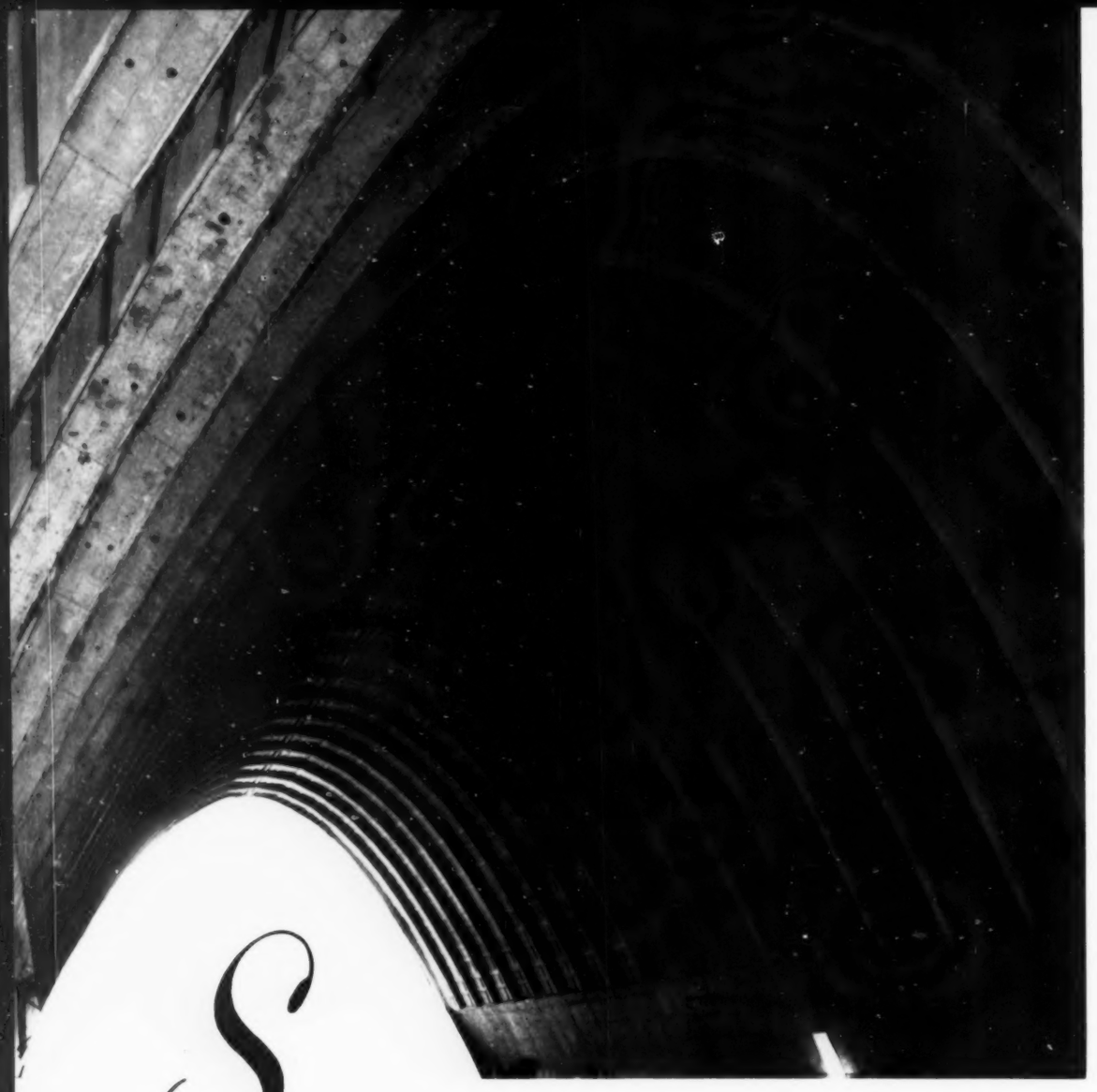


The cathedral-like "Nitra-Shell" storage building during construction. The building is 65 feet high, 300 feet long and 100 feet wide. Capacity is 20,000 tons.

Shell Haven fertilizer plant manufactures ammonia from fuel oil

New Shell petrochemical plant manufactures synthetic ammonia, nitric acid and ammonium nitrate. Special plants prevent nitrous fumes or chalk dust emission to the air.

Shell Chemical Co. Ltd.'s new fertilizer plant at Shell Haven in Essex (England), costing over £6½ million, was opened formally, May 22nd, with an annual capacity of 75,000 tons, 60,000 tons of which will be sold as such. Later this year, when all units are complete, the nitrogenous fertilizer "Nitre-Shell," hitherto imported from associates in Holland, will be available for the UK market.

In the late '20's, the Royal Dutch/Shell group decided to investigate the use of natural and refinery gases as a source of hydrogen which, together with nitrogen from the air, could be used in the manufacture of ammonia. At that time, there was no Shell source of these gases in Europe; so, in order to gain experience in the techniques of high-pressure synthesis, it was decided to use coke-oven gas, which was readily available, as a source of hydrogen. A new company, MEKOG, was, therefore, set up at Ijmuiden in Holland by the group to make use of coke-oven gas to produce ammonia from coke-oven gas and from atmospheric nitrogen. This company started to produce ammonium sulfate in 1929, and shortly afterwards its activities were widened to include nitrate of lime, the production of which from limestone and nitric acid started in 1930.

Rising production outran the availability of coke-oven gas and additional hydrogen was derived from water gas based on coke. With increased availability of nitrogen, a third type of fertilizer was introduced. This was the familiar ammonium nitrate-chalk blend known in the UK as "Nitra-Shell."

Shell has also been producing ammonia and nitrogenous fertilizers in the USA for nearly 30 years. In the West Coast states, Shell was the pioneer in producing ammonia from natural gas, and the Pittsburg (Calif.) plant is today the largest west of the Rockies. However, in the UK and Holland, natural gas and light refinery gases are not sufficiently plentiful to be used as a source of hydrogen for ammonia manufacture and, until recently, the nitrogen fertilizer industry has been based on coke.

It is of great importance to an oil concern with petrochemical interests that it should be possible to use any petroleum fraction for producing hydrogen. Group research has been successively directed to solving this problem and has brought to commercial fruition the Shell gasification process. In this, any petroleum fraction can be used, being burnt in a special burner in an atmosphere of oxygen and steam yield a mixture of hydrogen and carbon monoxide. The advent of this process meant that ammonia and nitrogenous fertilizer plants need no longer be built at places where refinery gases or natural gas are available, but where they can best serve market needs.

In view of the large potential market for such fertilizers in the UK, Shell Chemical Co. decided to erect a manufacturing unit at Shell Haven adjacent to the existing oil refinery. The facilities which led to the choice of site for the refinery were equally favorable for the fertilizer project.

At Shell Haven, about 80 people are employed in the various plants where air, oil, and chalk are used to make ammonia, nitric acid, and "Nitra-Shell." Ammonia is made by combining nitrogen and hydrogen together in the presence of a catalyst. The nitrogen is obtained by liquefying air and then separating the liquid nitrogen and liquid oxygen by fractional distillaton. The hydrogen is obtained by burning oil in a restricted amount of oxygen in the presence of steam, and adjusting the conditions so that the main products are hydrogen and carbon monoxide. More hydrogen is obtained by reacting steam with the carbon monoxide over a catalyst. The hydrogen is purified in a series of plants, mixed with the right amount of nitrogen, compressed, and passed over another catalyst. The ammonia so formed is kept under pressure, so that it remains liquid, and it is stored in a 1,000-ton sphere. Part of the ammonia is sold or used as such; the rest is burnt in air in the presence of a catalyst to give oxides of nitrogen, which are absorbed by water to give nitric acid. Some of this acid is sold as such; the rest is neutralized with ammonia to give ammonium nitrate. This, in turn, is mixed with specially treated chalk to yield the finished "Nitra-Shell."

Every care has been taken of the "social amenity" aspect in the plant design. In particular, a special plant has been installed to prevent emission of the nitrous fumes characteristic of nitric acid plants in the past, and an elaborate system has been set up to prevent dust emission from chalk drying and grinding and the preparation of granulated fertilizer. The process is described in more detail in the sections which follow.

Detailed Description of Process: Air Separation Unit—Since the air is required as nitrogen for ammonia synthesis and as oxygen for the Shell gasification process, the first plant required in the complex is that used to make this separation.

The air separation unit operates according to the Linde-Frankl system. Compressed air is cooled in stone-filled regenerators to within a few degrees of its dew point; it is then partly liquefied and finally rectified in a two-sectioned column to produce 95% pure oxygen and a nitrogen fraction containing not more than 0.01% of oxygen. Before leaving the unit, the cold products "give up their cold" to the regenerators which, in turn, cool down the incoming air.

Partial Oxidation Unit: Hydrogen for the ammonia synthesis is derived from gas prepared from fuel oil by the Shell gasification process. This is based on the noncatalytic partial oxidation of hydrocarbons and has

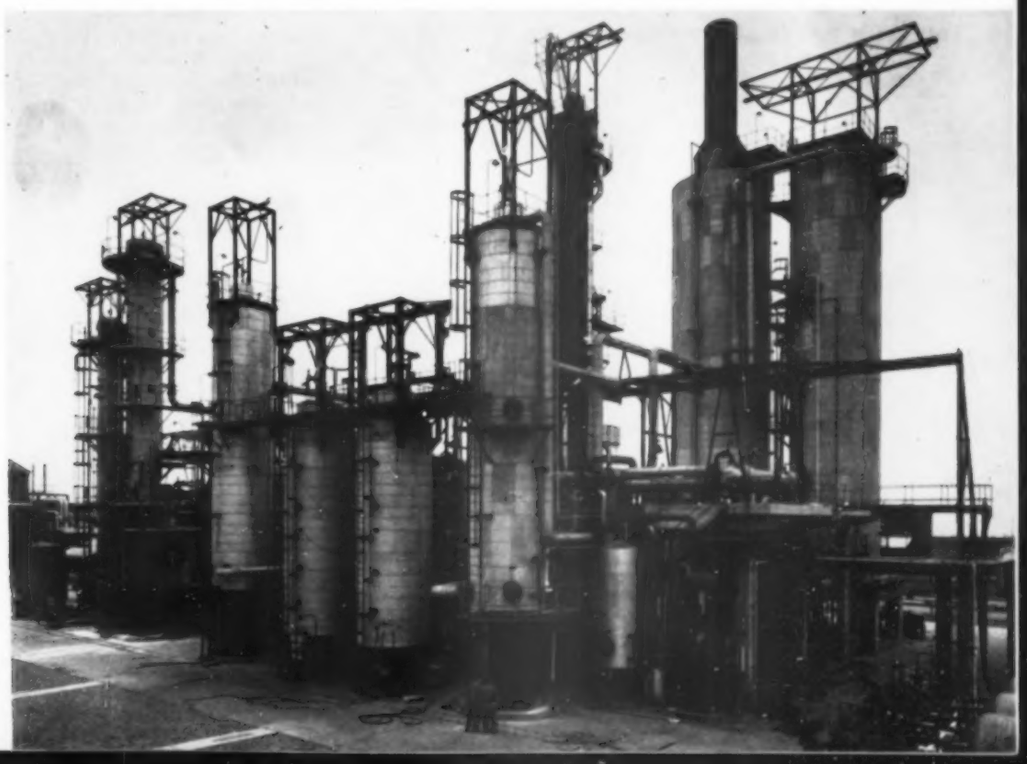
L. H. Williams, managing director, Shell Chemical Co., Ltd.

the following significant features: (1) the feed stock may range from methane to heavy fuel oil. (2) Operation may be at any pressure above atmospheric. (3) Most of the heat developed by the reaction may be recovered as high-pressure steam. (4) The equipment is compact, and carbon formed during the partial oxidation is easily and efficiently scrubbed from the gas.

Provision is made for the complete separation of carbon from the wash water which may then be recycled while the separated carbon is used as fuel.

At Shell Haven, heavy fuel oil is used as feed stock, and the synthesis gas is prepared in four reactors.

Synthesis Gas Purification—Primary Hydrogen Sulfide Removal—The raw gas from the partial oxidation section contains, in addition to hydrogen and carbon monoxide, some carbon dioxide, up to 1% by volume of hydrogen sulfide (depending on the amount of sulfur in the feed stock), and lesser amounts of methane and carbonyl sulfide. It is essential to remove the bulk of



Synthesis gas purification section.

the sulfur compound before the gas passes to the carbon-monoxide conversion unit. Because of the relatively large quantity of hydrogen sulfide to be removed, a regenerative process is desirable; and, in view of the high carbon dioxide content, it should be selective for hydrogen sulfide removal.

It has been decided to install the Shell phosphate process (the best for this purpose). In this system, tripotassium phosphate absorbs the hydrogen sulfide and some of the carbon dioxide under elevated pressure at ambient temperature or a little above, and is regenerated by boiling the solution of lower pressure. After treating, the outlet gas contains about three-quarters of its original content of carbon dioxide, but hydrogen sulfide is reduced to about —.01% by volume.

Carbon Monoxide Conversion—From the Shell phosphate treater, the desulfurized synthesis gas passes to the carbon monoxide converter, where, by reaction with steam, carbon monoxide is converted to carbon dioxide and hydrogen.

The reaction takes place in two parallel reactor systems and employs an iron-chromium catalyst. The incoming gas is first saturated with water vapor, then heat exchanged against hot partly converted gas, and finally super-heated steam is added just before the gas enters the converters. In the upper catalyst bed, the greater part of the carbon monoxide is converted, and there is a sharp rise in temperature. The partly converted gas is cooled by heat exchange with incoming feed, and passes to the lower catalyst bed where conversion continues until the carbon monoxide content of the outlet gas has been reduced to a low figure.

Final Hydrogen Sulfide Removal—At the outlet of the carbon-monoxide conversion unit, the synthesis gas contains about 0.05% by volume of hydrogen sulfide, which is rather higher than the hydrogen sulfide content at its inlet, owing to the conversion of carbonyl sulfide to carbon dioxide and hydrogen sulfide. It is essential to remove this hydrogen sulfide before the synthesis gas reaches the carbon dioxide absorption unit. The method adopted is oxidation to sulfur by passing the gas, to which a little oxygen has been added, over activated iron oxide. In this way, the hydrogen sulfide content is reduced to a negligible value.

Carbon Dioxide Removal—The synthesis gas leaving the oxide boxes still contains carbon monoxide, but has had all the other major impurities removed except carbon dioxide. This constituent can be absorbed in a number of reagents; after considerable investigation, it was decided to use a modification of the hot potassium carbonate process. This modification consists in the addition of a promoter, which leads to higher absorption and desorption rates of carbon dioxide.

Final removal of carbon dioxide is completed by a two-stage caustic-soda wash. At this stage, besides hydrogen, the synthesis gas contains some carbon monoxide, a little nitrogen, argon, methane and oxygen, and traces of carbon dioxide.

All these contaminants must be removed before the gas can be charged to the ammonia synthesis reactors.

Final Purification—The final purification of the synthesis gas is achieved very elegantly by scrubbing it with pure liquid nitrogen; the carbon monoxide, methane, argon, and oxygen are all liquefied and dissolved in the excess liquid nitrogen; purified hydrogen containing negligible amounts of impurities and mixed in the correct proportions with pure nitrogen passes forward to the ammonia synthesis section.

Ammonia Synthesis: The Fauser-Montecatini process has been adopted for the actual ammonia synthesis. This operates at a pressure of 250 to 350 atmospheres, and has the advantage that the heat of reaction is used for the generation of steam in waste heat boilers. Cold feed, together with the recycle gas entering the reactors, passes through heat exchangers countercurrent to the reacted gas and enters the catalyst-containing zone. Heat of reaction is absorbed in coils through which water is circulated in closed circuit. This, in turn, rejects the heat to boiler water for steam raising.

After leaving the reaction zone, the converted gas is further cooled, first by incoming feed and then by cooling water. Liquid ammonia is collected in the primary ammonia separator, and is pressured into the primary ammonia flash vessel. The flashed gas released here contains some nitrogen, hydrogen, argon, and methane, and is recycled to the suction of the feed-gas compressor, while the liquid goes to storage. Unconverted gas and ammonia vapor flow from the top of the primary ammonia separator to the suction of the circulating gas compressor, and further ammonia separates as liquid in the secondary ammonia separators. Recycle gas from the top of the secondary separator joins the fresh feed to the reactors, while the liquid joins that from the primary separator and goes to storage.

Liquid ammonia is pumped from storage by the ammonia shipping pumps to Fisons Ltd. Measurement is normally by flow meters, but a weigh tank is provided to allow periodic checking of the flow meters. Liquid ammonia is also used for refrigeration purposes in the Shell Chemical fertilizer plant, and the vapor return is used as feed stock to the nitric-acid and ammonium-nitrate plants. If the return from the refrigeration sections is more than is required for these purposes, it is compressed and returned to liquid storage.

Nitric-Acid Plant: The manufacture of nitric acid from ammonia falls into two parts: the oxidation of ammonia over a precious-metal catalyst to nitrogen oxides followed by the absorption of the oxides in water to yield nitric acid. There are a number of commercially established processes available, and these differ chiefly in the pressure at which the oxidation and absorption take place.

Ammonia vapor is preheated and mixed with the primary air before entering the reactor where burning to nitric oxide takes place on the surface of the catalyst. The heat of reaction is removed first in a steam superheater, second in a waste-heat boiler, third, by heat exchange with tail gas, fourth by heat exchanger with boiler feed water and finally, in water coolers. The process gas enriched with secondary air which has previously been used for bleaching raw nitric acid, enters the oxidation towers where the nitric oxide is oxidized to nitrogen dioxide and then passes up the absorption towers countercurrent to dilute nitric acid. Make-up water is injected at the top of the second tower at such a rate that concentrated acid of the desired strength flows from the bottom of the first tower. The acid is then bleached by countercurrent stripping with secondary air.

Tail gas from the top of the second absorber still contains traces of oxides of nitrogen. To avoid the possibility of air pollution, these traces of oxides in the tail gas are reduced to nitrogen by fuel gas over a catalyst developed by Engelhard Industries Ltd., the final effluent containing only 10% of that originally present. The heat energy of this tail gas is recovered by cooling it in a waste-heat boiler and finally discharging it to atmosphere through an expansion turbine.

General view of the plant during construction

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Making hole at Aguasay. Most of the wells are very deep, going to over 14,000 ft. Sinclair held its leases for 12 years before drilling techniques were developed that could go to that depth.

Broad, grassy plains and ranching country make the Llanos of Venezuela seem like home to West Texas and Wyoming oil men. Shown is a drilling rig at work in the Aguasay area (Sinclair photos.)

Sinclair Venezuelan Oil's active development program of 28 wells presented many drilling and completion problems, yet five field areas were defined and a major trend was outlined

THE Aguasay series of fields in eastern Venezuela have attracted attention because of their outpost relation to the fields of the Maturin Basin. Sinclair Venezuelan Oil Co. has carried out an active development program and to date 28 wells have been drilled, five field areas defined, and a major trend outlined. Aguasay is the deepest major trend being actively developed in this area, and as such, presents many drilling and completion problems.

As shown on the map, the concessions form a large block of 93,000 acres just east of the Anzoategui State line in the western tip of the state of Monagas. Just east of the main block is the smaller block known as east Aguasay with 12,000 acres. Topographically the concessions fall in the Llanos area, characterized by broad grassy plains with sparse or scattered trees. The region is very sparsely populated with a minor amount of cattle ranching. The higher mesas with elevations of 600 to 700 ft stand out above the river bottoms (300 to 400 ft), which in the case of the Guanipa is wooded.

The present development was touched off by the successful completion of Aguasay 3, which Sinclair had spudded May 21, 1956 and completed on October 6, 1956. The well was drilled to 14,221 ft in 99 days. The sand section of the Oficina area from the E Sands down into the U Sands was found well developed, and the well was completed as a dual zone producer in the S and T Sands for 1,309 b/d, 36° API, on 1/4" choke. On the basis of the well and the regional picture built up by the exploration department, Sinclair immediately went ahead with plans for a 42 kilometer pipeline to tie in the new development with the 16" Amana pipeline to the north connecting the Santa Barbara area with the Sinclair Terminal at El Chaure. Although it was necessary to make surveys, secure right-of-way, and let contract, the line was built and in operation within six months. Present capacity of this connecting line is 20,000 b/d.

In the meantime, drilling of the No. 3 Block around the discovery well was stepped up to two rigs and Venezuelan Atlantic, which holds the neighboring San Jose de Guanipa concession to the northeast with Pancoastal, moved in to offset Sinclair. The VARCO Pancoastal group had participated in the Sinclair well on a dry hole basis.

On December 12, 1956, the second wildcat, Aguasay 4, was spudded nine kilometers to the west, on what was believed to be the

Venezuela's Aguasay discovery

same trend but a different trap. This well was drilled in 102 days to a total depth of 13,362 ft, and completed on April 2, 1957, as a dual zone producer on ¼" choke for 1,624 b/d from the T and U Sands, 37° API oil. With two successful wildcats bringing in two field areas, it was evident that Sinclair's evaluation had been warranted, and the company was looking at a major trend development, possibly similar to other major trends in the Anzoategui fields. When within the last year the wildcats Aguasay 5-A, Aguasay 6, and East Aguasay were drilled, the trend was confirmed, though still not fully blocked out.

The Aguasay concessions were acquired by Sinclair in 1943. At the time the concessions were taken up, drilling depths to the Oficina oil zone were admittedly out of the range of commercial development, both as to cost and probably drilling technology. Deep wells in the El Roble field of Creole west of Anaco were taking from nine to 13 months to drill and complete at depths of 12,000 ft, and it was felt that the Aguasay area would run deeper. Sinclair, however, looking ahead, felt that in view of the certainty that the Oficina sand section would be present and capable of yielding commercial oil, that the advances taking place in drilling technology would permit drilling in the life of the concessions, retained the 105,000 acres presently held. At the time the concessions were taken out, there was no nearby production, and the nearest producing area was the Guara Area 25 kilometers to the southwest. The acreage was surveyed in 1945-1946 by a seismograph reflection reconnaissance survey, and in 1949 a detailed reflection survey was carried out on the southwesternmost part of the acreage. No very clear structures were blocked out in the last survey, but nearby developments were closely followed. After development of the Zorro Area by Mene Grande, it was felt that Aguasay 1 should be drilled for acreage evaluation. It was spudded March 22, 1955. The Oficina Sand Section from the E to U was well developed as expected, but oil shows were disappointing. A thin 3-foot U-1 sand with abnormal pressures was found which at first tested better than 1,100 b/d, but due to faulty casing job, this rapidly declined. Aguasay 2 spudded upslope, made a good well in the R sands, but neither of the two wells being encouraging, further drilling was postponed. In the meantime a more intensive seismic survey was begun as it was obvious that the time had arrived for more detailed evaluation and development of the block. Indications of structure down dip had been picked up and it was felt that in view of improvements in seismic exploration and in drilling that the time had come for intensive exploration of the block.

Field work was started in November 1955, and shooting was carried on until December 1957, during which period the entire concession area was covered. It was apparent that the first point of attack from the drilling standpoint would be what is now the No. 3 Block, a trap formed by fault intersection. The well Aguasay 3, as stated, was a success, but the confirmation well, 3-2 did not check the structure, and intensive office re-work of the picture followed.

The general picture that Sinclair came up with as a result of re-work was essentially a very complex structure in the pre-Oficina formations over which the Oficina had been deposited and later fractured along the same trend. Sinclair found it had repeated the experience of other operators in the area. Location of a trend in the pre-Oficina formations had been simple, but the problem of working out the structures in the oil zone had turned out, as shown by 3-2, to be a little more than tricky. Although reflections in the Oficina are usually fair to good, in the trend area they were poor, and in many places blank zones located above prominent pre-Oficina structures had caused the interpreter to run these structures up through the unconformity. Unlike some areas to the southwest, depths shut out the practicality of following seismic studies with structure drilling to check the seismic picture according to Sinclair's exploration staff.

Now that Sinclair's staff had the story, it turned out to be possible to pick the major structure. Developments to date in Block 4, the discovery of Block 6, Block 5, and East Aguasay, indicate that the seismic method

A seismic crew readies a shot hole in the Aguasay area.

can be applied if the structure history of the trend is taken into account.

From the seismic standpoint, East Aguasay is of considerable interest. The original job based on surveys made from August 20 to November 4, 1953, indicated anomalies, however after the trend through the western series of fields had been worked out, it was found that the picture could be made out. East Aguasay 1, located eight miles east of production, was completed on May 24, 1959 as a dual zone producer from the F-1 and F-5 sands on ¼" choke for 1,465 b/d 40° API gravity. The trap is formed by contour closure along the prominent master fault system of the Aguasay trend, with down dip side raised along the fault about 600 ft in the lower part of the oil zone. The well encountered good commercial shows in the lower sands, but due to unsuccessful fishing job and R and S sands could not be tested, and a well was made in the developed F section. At the time drilling of the well was being discussed, depth to the U section was a matter of debate. In the absence of velocity control it was felt that depths might range from as shallow as those in the Block 3 to as much as 1,500 ft deeper if the regional velocity gradient did not change. Actually formation top of the U ran 1,000 ft deeper than the U sand top of Block 3. At present East Aguasay 2 has been located on another trap about five kilometers east of the first test and is expected to confirm extension of the trend to that point.

North of the main trend which has now been marked by Blocks 4 and 6, by Blocks 3 and 5, by the VARCO-Pancoastal Caro, and by East Aguasay, seismic surveys indicate Sinclair has other prospects for exploration further down dip into the basin.

Formations: At the time the present Aguasay concessions were retained, Sinclair felt that the Oficina oil section would be found well developed. That this was the case has now been proved by drilling. About 2,300 to 2,500 ft of section representing the series from the E to the U is present throughout the trend at depths ranging from about 11,000 ft to the top of the E in Block 4 to about 12,300 ft in East Aguasay. As in other areas to the west the sands correlate well, where developed, with sands in other fields, but there is no lateral continuity of the sands. The sands are all channel type deposits but show common electric log patterns from channel to channel just as trees in a region will show common ring patterns. As a result of the channel nature of sands, variations in porosity and permeability from place to place in the channel can be expected, as well as development of sedimentary structures, not apparent on electric log or in plug core samples, but which can seriously affect or limit size of the well drainage and cause the inexperienced engineer some tough problems during completion. On the other hand relatively thin sands may show extreme lateral communication over a number of 160-acre locations with measurable effects in bottom hole pressures.

The surface deposits in the area include not only the surface sands and gravels but a series of older Mesa deposits made up of variegated pink, buff and red clays and sands forming picturesque bad land topography in places along the rivers. Under these deposits is a series of Pliocene fresh to brackish water clays and sands called the Las Piedras formation. The Las Piedras is of considerable interest in view of the occasional thick water sands which are found to carry water under high pressures. Evidently some of the sands represent old stream channels and are repressured from surface waters on the higher mesas to the extent that pressures are above hydrostatic.

The Las Piedras blankets the older marine section, the top member of which is the Freites Miocene formation, almost exclusively gray shale in the Aguasay trend. The Freites formation is the equivalent of the La Pica formation, noted for its mixed base oil fields to the north in the Santa Barbara-Jusepin area and on east to the Pedernales and Gulf of Paria fields. Although Sinclair drilling has not as yet developed any sands in the Freites, there is some expectation that sand development with possible shows may be found north of the present trend. The Freites blankets the underlying Oficina at depths of from 9,000 ft in the western part of the trend to over 10,000 ft in the eastern end.

The Oficina as mentioned includes the sand section of Anzoategui from the E to the U but the upper sands are not developed, reflecting the approach to the more marine conditions existing in the old Maturin Basin. Also it might be pointed out that the uppermost regressive sands found at places in Monagas in the Jusepin area have been removed in the Aguasay Trend. The lower sands of the Oficina variously known as the U and Merecure in the Aguasay trend appear to be a potentially important oil producing section but as yet the main channels have not been encountered in drilling. Only the upper few hundred feet of the U have been drilled but there is no reason to suspect it may amount to more than 1,500 ft in all. The Cretaceous in this area has not been explored and will not be until the problems of drilling the shallower formations have been solved.

Structure: The structure of the Aguasay trend is only now being worked out by drilling and it would be premature to publish any geologic map. However, as intimated from the brief review of the development of the seismic picture, it consists of a major fractured zone, possibly involving reverse faulting on the order of 1,500-foot displacements and trending in a roughly easterly direction. The pattern in the Oficina oil section which was deposited over this trend shows a dominantly easterly trending series of faults with the basinwards or down dip side raised by amounts up to 600 ft with respect to the shield side. These faults form a complex pattern with numerous cross faults offsetting them and forming separate fault traps.

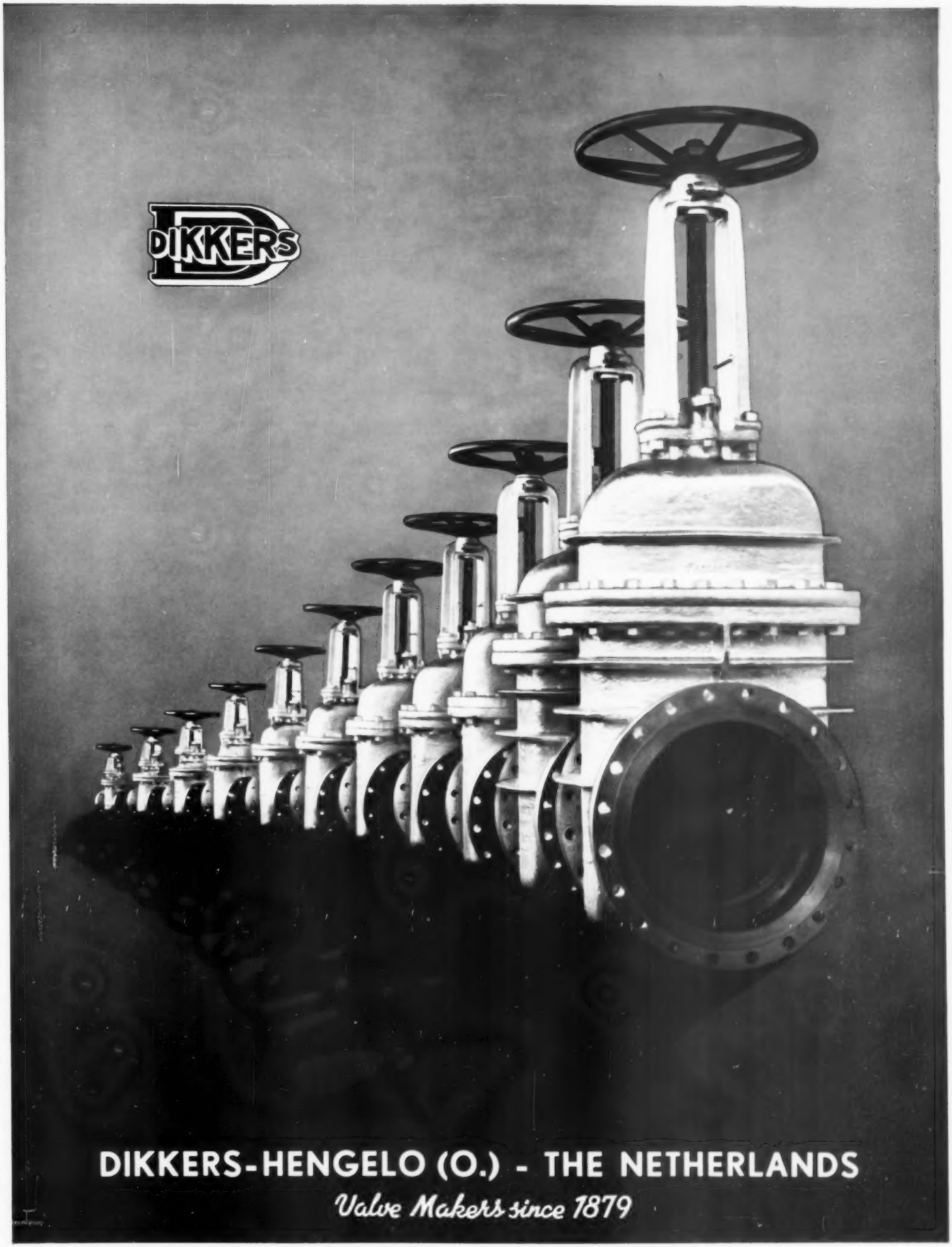
Block 4, which is as yet only incompletely known, is essentially contour closure against a fault as in Block 6. Blocks 5 and 3 however are fault intersection structures. East Aguasay 1 is located on contour closure against a major fault, but East Aguasay 2 will be located on a probable fault intersection type of trap.

Of considerable interest from the oil accumulation standpoint, however, is the importance of structures involving partial or complete closure by sedimentary structures. In view of the large number of individual channel sands, it could be surmised that at many places along major faults the up dip trapping afforded by the fault would result in accumulation, lateral closure being afforded by the shale out along the channel edges. South Aguasay, which takes in the original Aguasay 1 and 2 wells, appears to be an area of this type, with trapping in the various sand channels against a major fault located just south of the concession boundary. Several profitable reservoirs have been worked out in this general area and it is quite possible that more will be discovered, though to date no really important reservoirs have been discovered.

Drilling: All drilling in the Aguasay area has been by contractor. In Aguasay 1 no particular difficulties were encountered in drilling, until at 12,500 ft a thin, high pressure sand was drilled, which involved weighting the mud up to 12.5 lb/gal to bring the well under control. This was a most unusual situation for Anzoategui, as it is probably the only case in which a U sand of more than hydrostatic pressure has been drilled. The sand was only 3 ft thick according to the electric log, and as yet the high pressure has not been explained. As a result of having to weight the mud up, lost circulation problems were encountered in the Freites and Oficina sands above the Oficina sand section.

In drilling Aguasay 2, however, no difficulties were encountered. Aguasay 3 was drilled to total depth with no difficulties, in 99 days. However, with the drilling of Aguasay 3-3, it was found that Sinclair was up against a somewhat different situation than operators to the west in Anzoategui. In Aguasay 3-3, strong water flows were encountered in the E Sands at the top of the Oficina sand section. These sands had been faulted out in Aguasay 3, the discovery well. In 3-3, several weeks were lost after building up mud weight in cleaning out and getting the hole into condition to drill ahead. Due to the necessity of carrying 12.5 lbs. mud when the S sand section was penetrated, a certain amount of lost circulation difficulties was encountered. Later in the drilling campaign, when Aguasay 3-10 was drilled, the same difficulty with water flow from the E Sands was encountered.

The general explanation of the abnormal pressures causing water flow in the E Sands is believed to lie in the fact that the underlying shale section has just about reached its limit of competency at a certain depth, or approximately 11,000 ft. The breakdown of the shale results in transmission of pressure to the sands immediately underlying



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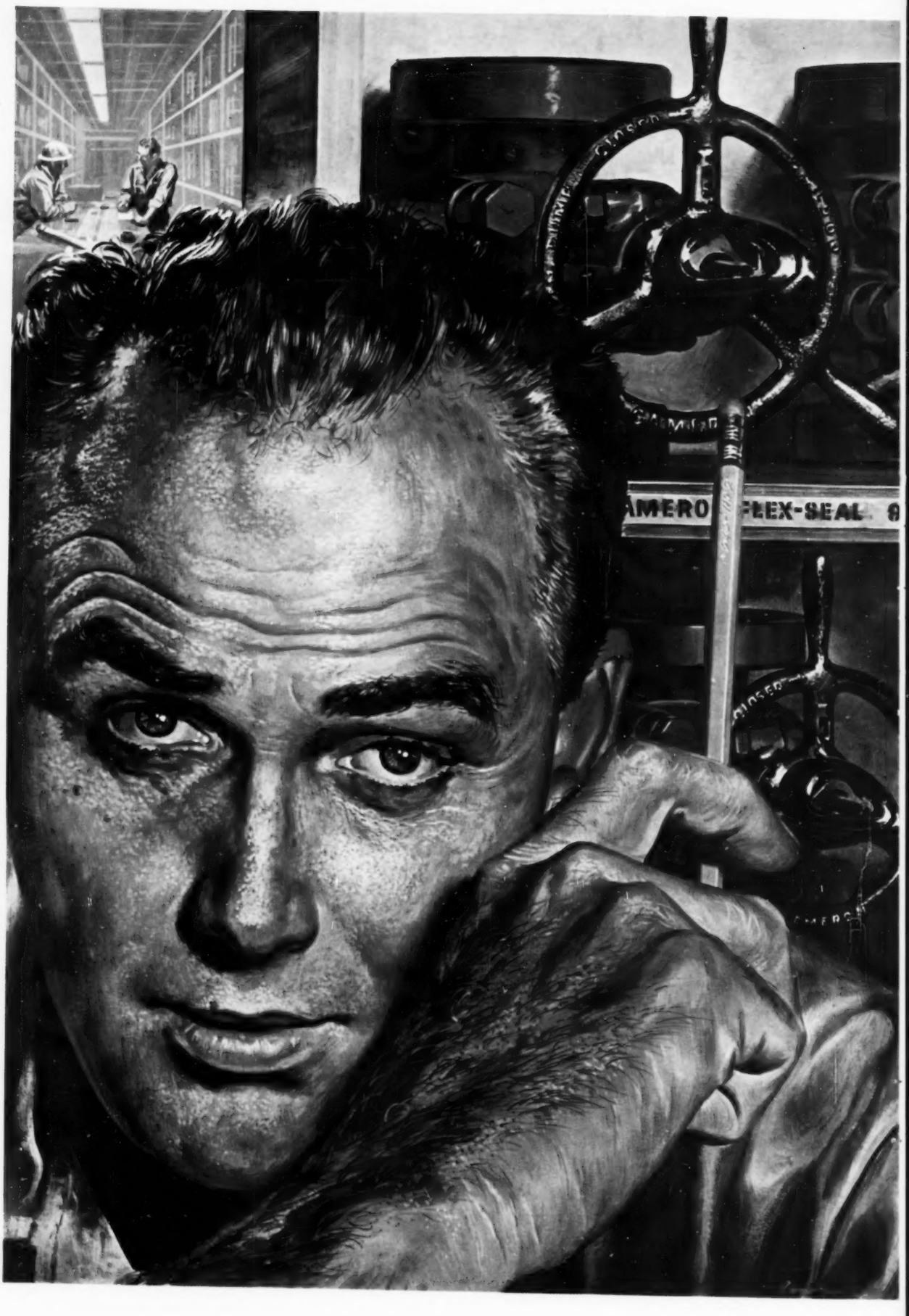
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but these pressures are not transmitted to the underlying beds, which are competent enough to withstand loading, and as a result of only normal hydrostatic pressures. This general idea is believed to have been confirmed in the more recent wildcat Aguasay 5-A, in which the mud logging unit recorded water flows from the shale within the few hundred feet above the E sands before penetration of the E sands occurred. Sinclair at the present time is faced with the problem of working out a drilling program for the area, but because of the situation which is caused by prevalence of greater than hydrostatic pressures in the E sands, coupled with hydrostatic pressures in the sands underneath, has been faced with the necessity of running a protection string through the E sands.

Development: Sinclair has completed a total of 25 oil wells on its Aguasay group of concessions and as of this writing has three wells in the process of being completed. The accompanying map shows the location of this development. An additional step-out well is being drilled to the northeast of the number 4 area and a step-out well on the East Aguasay Block is drilling approximately three miles to the east of the No. 1 discovery well. Current production from the area is approximately 13,000 b/d and the average pipeline stream is 39° API. Operations are now being curtailed due to the present economic situation existing in the oil business and to mandatory restrictions on imports into the United States of petroleum and petroleum products.

The producing areas on the large Aguasay block are connected by a gathering system to the pipeline station located about midway between the 3 and 4 areas. The East Aguasay area is not connected as yet and it is planned to postpone any line until confirmation drilling has been done.

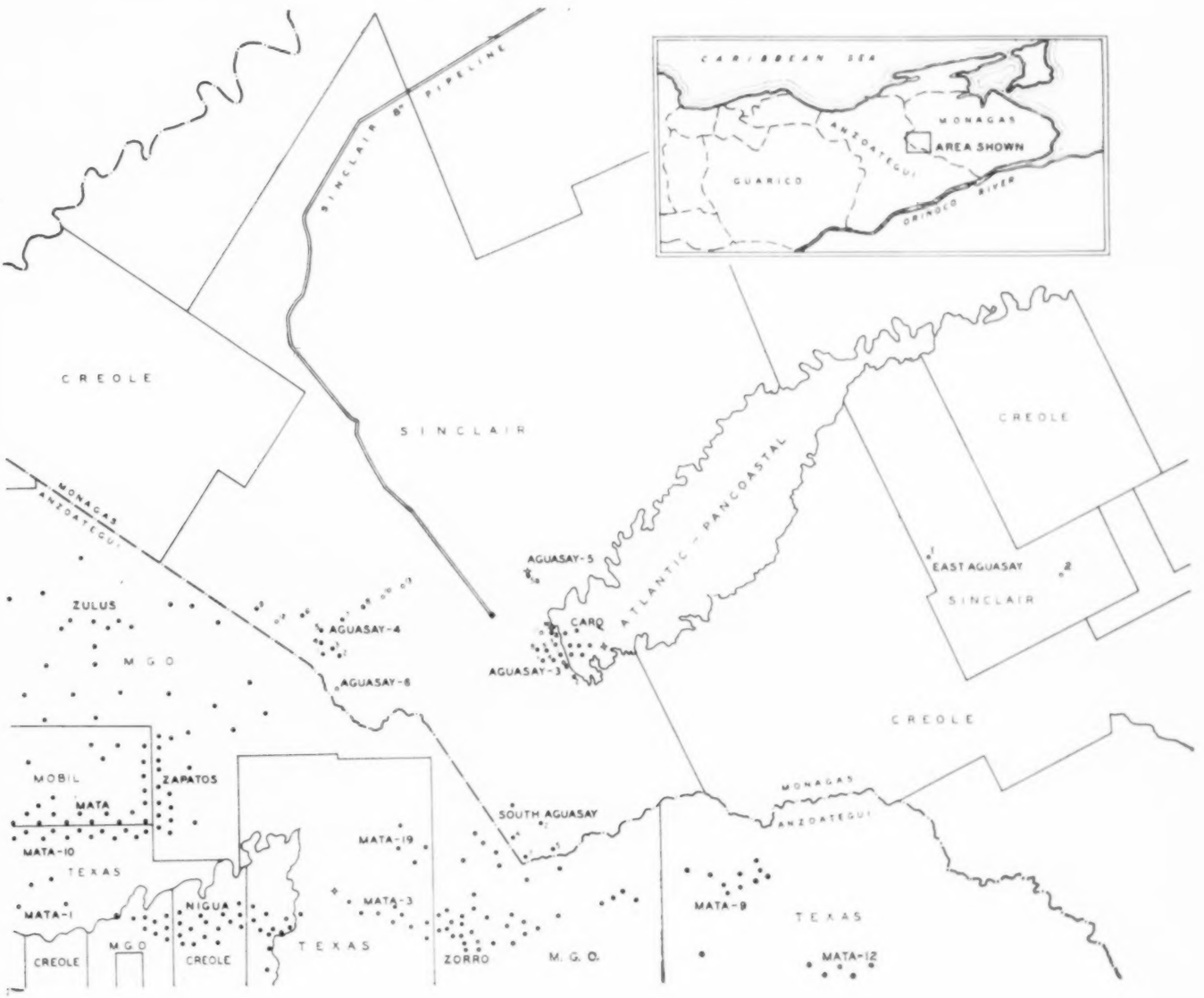
Engineering is currently underway for a gas products recovery plant to be constructed at Aguasay and this plant will be started as soon as engineering is completed and the necessary permits obtained from the Venezuelan government for its construction. It is anticipated that the plant will have a capacity of around 60 million cubic feet per day for processing.

The Aguasay trend appears to be an important one and, as indicated by the map, has extended both east and west on concessions adjoining the Sinclair block. It is entirely possible that the East Aguasay discovery may be a further extension of this same trend, although additional development will be required to determine this possibility. Although deep and expensive to drill, the fact that this is a multiple sand area and that the sands have fairly good thickness and in the aggregate represent a considerable amount of productive sand in each well indicates that the area should be profitable and that the reserves may be sizable. END

AGUASAY

(Eastern Venezuela)

Concession holdings and wells as of July 13, 1959



B. H. J. Bell

Fisons' new nitrogen plant

by B. H. J. Bell, B.Sc.

THE new chemical factory built by Fisons Ltd. on Thames side at Stanford-le-Hope, Essex, and now in production with a capacity of 400 tons per day (140,000 tons per year) of ammonium nitrate, will provide nitrogen in the form of ammonium nitrate for use in Fisons compound granular fertilizers. The product is made in a two-stage process, using as raw material synthetic ammonia produced at the adjacent ammonia plant recently completed by Shell Chemical Co. The ammonia, 99.9% pure and with a maximum oil content of 15 ppm, is transferred by pipeline as liquid under 180 psig pressure. The daily requirements of Shell Haven are 145 tons. Liquid ammonia is stored on the Fisons site at 55 psig and 5 C in an insulated sphere of 2,000 tons capacity, the largest of its kind in Great Britain. A vapor recompression and cooling unit maintains the required conditions in the sphere.

In the first operation, vaporized ammonia is oxidized catalytically to nitric acid in a unit supplied by the Chemical and Industrial International (C & I I) of Nassau, Bahamas, and employing a modification of the well-known and widely used du Pont process. This process, operated with compressed air at 8 atmospheres, has considerable advantages over lower-pressure systems in terms of capital cost and compactness of layout. For instance, only one absorber is employed in the unit, which has a capacity of 223 long tons (250 short tons) of 100% acid per day. Large savings in stainless steel are thereby realized. Points requiring particular attention in a unit of this type are conversion efficiency and control of catalyst losses. The catalyst is a platinum-rhodium gauze pad, a complete charge consisting of 36 hexagonal gauzes 36 in. in diameter, weight approximately 500 troy ounces. Reaction on the gauze is controlled at approximately 950 C; and, once reaction has been initiated electrically, the heat of the reaction maintains the temperature:

$$4NH_3 + 5O_2 \rightleftarrows 4NO + 6H_2O + 216.6 \text{ Kcal} \quad (1)$$

The concentration of ammonia in the ammonia compressed-air mixture is maintained at 10.3% maximum by volume to avoid the explosive mixture range, and automatic alarm and shutdown are provided to protect the catalyst should this figure be exceeded. With insufficient air, another reaction is favored:

$$4NH_3 + 3O_2 \rightleftarrows 2N_2 + 6H_2O + 302.7 \text{ Kcal} \quad (2)$$

And a further reaction, which would also cause loss of efficiency, is:

$$6NO + 4NH_3 \rightleftarrows 5N_2 + 6H_2O + 431.9 \text{ Kcal} \quad (3)$$

This reaction will take place when conversion at the gauze is incomplete, probably due to excessive velocity through the catalyst.

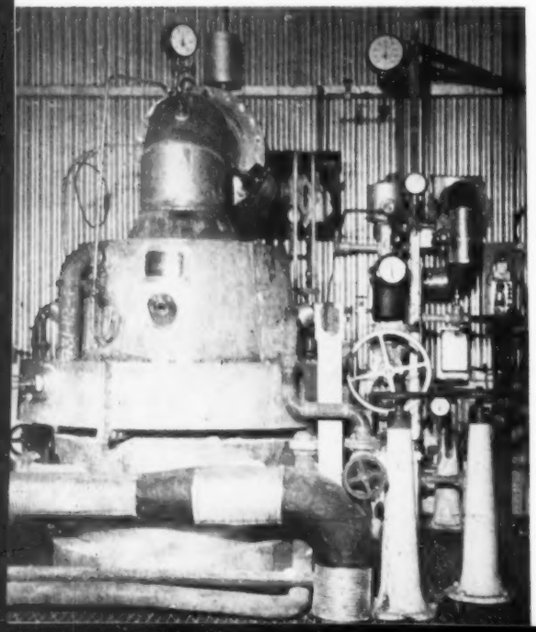
The most noteworthy features of this nitric-acid plant are the methods of recovery and utilization of process heat, and the equipment used for the removal, by catalytic reduction, of the residual oxides of nitrogen in the tail gases. The heat evolved in the highly exothermic ammonia-oxidation reaction is utilized to:

1. Heat compressed air in a heat exchanger before reaction: a preheated gas mixture at approximately 300 C is thereby obtained.
2. Vaporize liquid ammonia for the process.
3. Heat tail gases in another heat exchanger en route to a gas turbine; this turbine provides about two-thirds of the energy required to drive the air compressor.
4. Provide superheated steam at 280 C and 200 psig for a steam turbine; this is mounted on a common shaft with the air compressor and the gas turbine, and provides the remainder of the compressor power requirement.
5. Heat in a further heat exchanger the tail gases from the absorption column prior to entry to the tail-gas reduction unit.

In the reduction unit, or fume eliminator, oxides of nitrogen are reduced by fuel gas over a catalyst supplied by the Catalytic Combustion Co., of Detroit. The catalyst is a noble metal mixture deposited on a crimped nichrome ribbon, the ribbon being compressed into a bed through which the gases pass. Reaction with the hydrocarbons in the fuel gas takes place at a catalyst temperature of 850 C; e.g.:

$$CH_4 + 2NO_2 \rightarrow N_2 + CO_2 + 2H_2O \quad (4)$$

This nitric acid plant converter contains platinum-rhodium gauze pads, valued at £15,000, through which ammonia is passed, converting it to oxides of nitrogen.



A harmless and practically colorless effluent is thus obtainable.

The heat of reaction in the fume eliminator is recovered in a waste-heat boiler to provide part of the superheated steam required for the turbine. The remaining steam is recovered from hot gases, leaving the convertor in a second waste-heat boiler.

To start up the plant, steam for the turbine is obtained from the boiler house; but, once under way, the process is sustained entirely by process heat assisted by the heat generated at the fume eliminator.

The process gases, containing approximately 9% NO, and after cooling in various ways as described above, are led at a temperature of 120 C into a cascade cooler, where further cooling by salt water drawn from the Thames takes place. Oxidation of NO to NO_2 by the excess oxygen in the gas stream occurs throughout the cooling stages, but mainly at the cascade cooler:

$$2NO + O_2 \rightleftarrows 2NO_2 + 27.1 \text{ Kcal} \quad (5)$$

and some weak nitric acid (about 50% strength) is formed at this stage by reaction between NO_2 and the water present in the process gases. This acid is forced out into the absorption column by means of an air lift. In the absorption column, which consists of 35 bubble-cap trays fitted with cooling coils, steam condensate is introduced at the top and the process gases at the bottom. Absorption takes place and nitric acid is produced:

$$3NO_2 + H_2O \rightleftarrows 2HNO_3 + NO + 32.3 \text{ Kcal} \quad (6)$$

Both oxidation and absorption reactions are thus favored by high pressure and low temperature. The acid in the base of the column is continuously swept by a current of air to remove dissolved oxides and to re-oxidize the NO produced in the reaction. An acid of 57% to 58% strength is produced, and runs to storage under the pressure in the column.

An overall conversion of 92.5% is guaranteed; the plant shuts down every three or four weeks to make good catalyst losses, and to remove catalyst poisons by pickling in acid.

The ammonium-nitrate plant employs the so-called Stengel process, developed in the USA by the Commercial Solvents Corp. of New York. The Stanford-le-Hope unit is the first in the UK to employ the principles involved. In the more conventional types of unit hitherto in use, and involving a large body of reacting liquid, the concentration of solution produced is limited to about 86% NH_4NO_3. In the Stengel unit, concentrations of well above 90% are obtainable, but at Stanford-le-Hope Fisons requirements are met by an 88% solution. Nitric acid, preheated to obtain the required concentration of the salt, and vaporized ammonia are metered through a mixer and into a reactor packed with stainless-steel rings. Here reaction takes place, the rings providing the reacting surface; and ammonium nitrate is produced as a fog which coalesces and runs down into a cyclone separator:

$$NH_3 + HNO_3 \rightarrow NH_4NO_3 + 25.5 \text{ Kcal} \quad (7)$$

The heat evolved is sufficient to boil off most of the water originally present in the nitric acid. The steam is removed by the separator, and is used to vaporize incoming ammonia for the process. Ammonium nitrate is pumped away continuously to stainless-steel-insulated storage tanks (two tanks with capacities of one million and one-half million gallons, respectively). The solution is circulated in storage through external heat exchangers at approximately 120 C before dispatch. The Stengel plant is highly instrumented to insure accurate control of operating conditions. Startup and shutdown are virtually automatic.

A minimum yield of 98% NH_4NO_3 is guaranteed, and the unit operates at 400 tons of product per day (100% basis). 70% of the Stengel plant acid requirement is provided by the C & I I nitric-acid unit, the balance for continuous operation being obtained from the nitric-acid plant at Shell Haven: The daily offtake from Shell will be 92 tons (makeup to 5% to 10%). Another average daily requirement will be 5,000 therms of refinery gas.

Special arrangements are made for transporting the hot concentrated solution to Fisons compound fertilizer factories in various parts of the country. In all, eight factories will receive the new material: two (at Avonmouth and Immingham) by rail in especially constructed tankers. Each tanker is of 3,300 gal capacity, designed for a maximum speed of 70 mph, and fitted with vacuum brakes. The tankers are insulated and supplied with steam coils to maintain the liquid above its freezing point (85 C) in case of delay in transit.

The company owns a total of 45 of these tankers; 15 are dispatched daily to either Avonmouth or Immingham. Loading and preparation of a complete train takes about four hours. The other factories (at Barking, Boston, Goole, Ipswich, Plymouth, and Widnes) are supplied by road. A fleet of 15 road tankers, each of 2,400 gal capacity, is operated under contract by Road Services (Caledonian) Ltd. Loading and delivery are on a 24-hour basis; eight tankers can be filled in one hour.

Extensive modifications have been made at the fertilizer factories to handle the new material. At these factories, ammonium nitrate, with a nitrogen content of 35%, will replace ammonium sulfate (20.8%), hitherto employed as the nitrogen source for the compounds. With increased nitrogen concentration, there are obvious advantages in bulk, in handling, in storage and in usage, but the new salt has a special advantage to agriculture in that it provides nitrogen in two forms, the nitrate nitrogen being assimilated more rapidly than the nitrogen in the ammonium radical. The combination gives a better opportunity for securing optimum yields over a wider range of soils and climatic conditions.

Services requirements at Stanford-le-Hope may be summarized briefly: Cooling water is obtained from the Thames via the Shell-Haven pumping installation. After dosing with aluminium sulfate and settling in a conical sedimentation tank to remove sludge and flocculated matter, the clarified water flows to a concrete inflow pond. From here it is circulated to the process units by two variable-speed 6,000 gpm centrifugal pumps, returning after use via a gravity channel to a collecting pond. From this pond, it is pumped over a cooling tower and returned to the inflow pond. Makeup water, to replace spray losses and to control solids content of the water, is drawn from Shell Haven, and the quantity will vary from 5% to 10% of the total usage, depending upon conditions. Chlorination is carried out in the intake pond to inhibit the growth of marine organisms.

In the boiler house are four packaged-type oil-fired boilers, each with a capacity of 17,250 lb per hour and operating pressure of 200 psig. During normal operation, only one boiler is in use, but all four are required for starting up the nitric-acid plant when the steam required for the turbine is superheated to 280 C by means of an oil-fired Urquhart superheater.

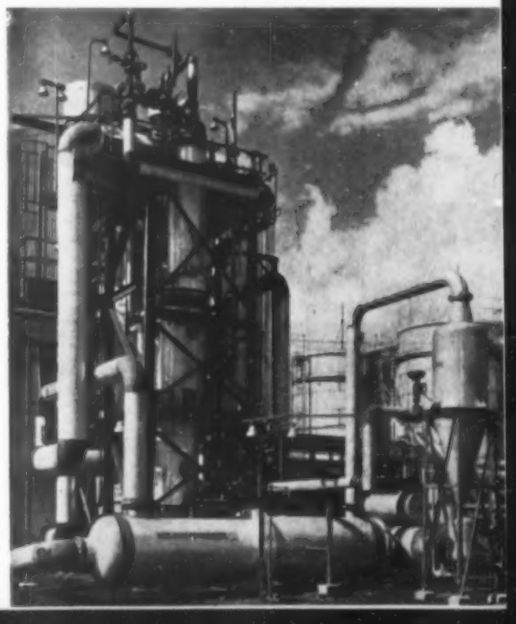
Electric power for the site is fed from a 1,500-kva Eastern Electricity Board supply. Emergency power for maintenance of essential services is available from a standby diesel generator.

Sewage and domestic effluents are treated in a sewage purification plant before discharge to the river.

Administrative and other buildings include the office block, canteen and ablutions, laboratory and plant office, workshops and stores, instrument and carpenter shops, experimental building, locomotive shed, and two substations for power distribution. The total number of people employed at the site is 120, of whom 40 are staff and 80 wage earners.

The total area of the site is 63 acres, of which 25 acres have so far been developed. There is room for expansion of processes, services, and storage facilities on the developed area before extending operations to the underveloped part of the site. END

Eastern end of the compressor house, showing waste heat boilers, tail gas preheater. Nitric acid storage tanks are in the background.



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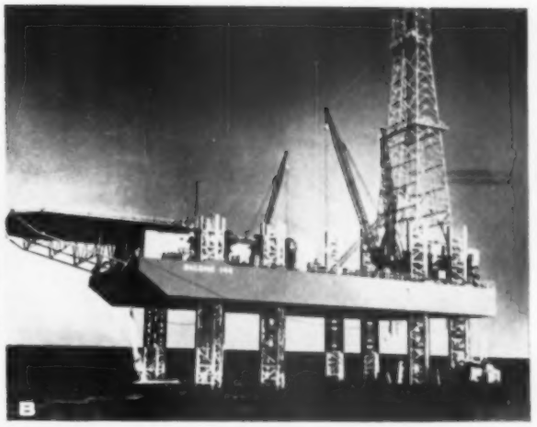

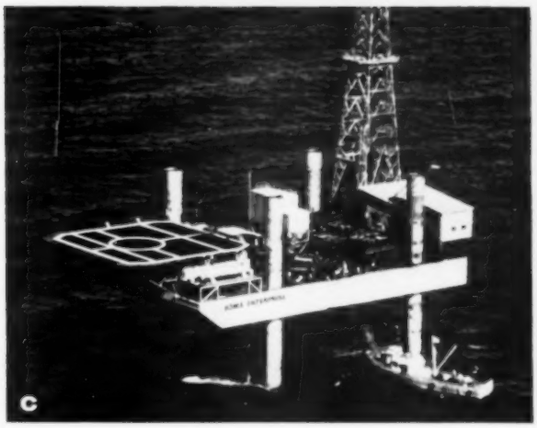

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Review of recent USA patents on Oxo

by Heinz Heinemann and Harold Shalit

THE current Patent Review deals with the Oxo process for preparing oxygenated compounds from olefins. Briefly, the Oxo process consists in reacting olefins with carbon monoxide and hydrogen in the presence of an iron group catalyst, usually a carbonyl of cobalt. In this first stage the principal product is an aldehyde containing one more carbon atom than does the olefin.

$$R{-}CH{=}CH_2 + CO + H_2 \rightarrow R{-}CH_2{-}CH_2{-}CHO$$

The aldehyde may then be hydrogenated to the alcohol or oxidized to the corresponding acid; however, before either of these reactions are carried out, it is necessary to remove the cobalt catalyst from the aldehyde product. The process presents several interesting problems allied with preparation of the catalyst, operation of the carbonylation reaction, decobalting the aldehyde product, and subsequent treatment of the products. These aspects will be considered in this review.

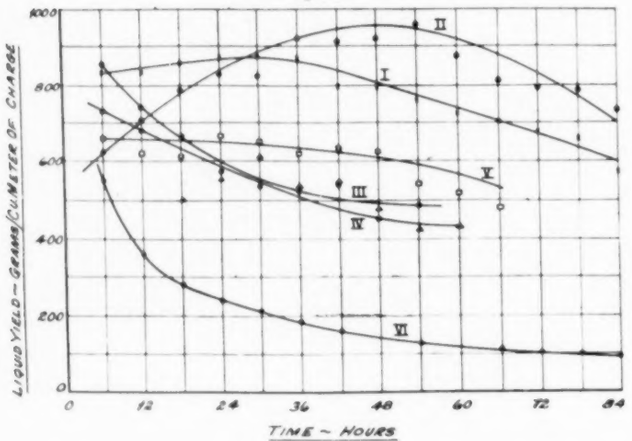
The importance of the Oxo process lies in its ability to produce valuable products from relatively cheap raw materials. The aldehydes are used as chemical intermediates, the alcohols as solvents and as ingredients in, for example, plasticizers, and the acids are also useful as chemical intermediates. Attesting to the importance attached to this process, some fifty-six selected patents are reviewed here, the earliest from about the middle of 1955, the latest having been issued late in 1958.

OXO FEED PREPARATION

A group of patents dealt with purifying olefin feed to the Oxo reactor; among these purifications are diolefin and sulfur removal. In *2,752,386 (to Imperial Chemical Industries) N. Ackroyd and S. A. Lamb* state that, to make colorless esters from Oxo alcohols, the olefin feed must be free of aliphatic di- and polyenes and cyclic olefins and diolefins which can form hydroperoxides. These undesirable compounds may be separated by distillation or solvent extraction, or the original mixture may be protected against hydroperoxide formation by addition of an inhibitor. The resulting mixture may then be carbonylated, hydrogenated, and esterified. *P. G. Harvey and S. A. Lamb (2,752,395 to Imperial Chemical Industries)* oxoate cracked hydrocarbon streams containing di- and polyolefins after first removing the di- and polyolefins. An *Esso Research and Engineering Co. patent (2,796,436 by F. J. Buchmann, J. K. Mertzweiller, and E. V. Fasce)* claims several methods for removing diolefins from Oxo feed. One such method comprises treating the feed under carbonylation conditions with an agent reacting selectively with the diolefins, e.g. organic peroxides. It is also specified that selective hydrogenation over molybdenum or tungsten sulfide may be used to remove diolefins.

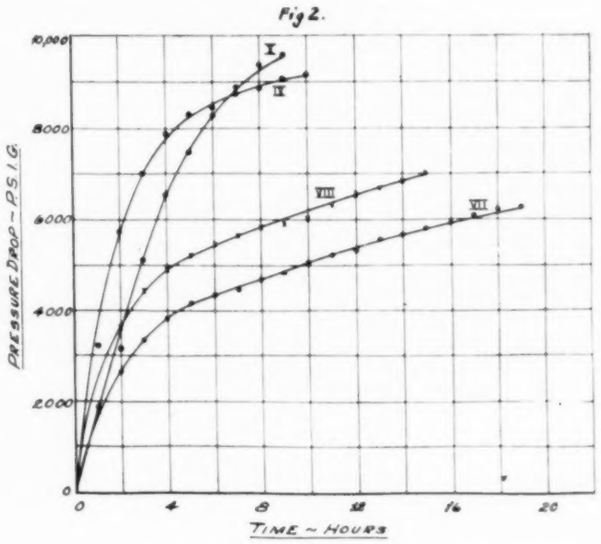
Fig. 1 and Fig. 2. Yield-Time Relationships for Different Catalysts: USA Patent 2,830,089 to J. W. Fitzwilliam et al., dated April 8, 1958.

Fig 1.



I – 90 Co – 10 Al_2O_3 – 0.1% Na_2O
II – 80 Co – 20 Al_2O_3 – 0.07 Na_2O
III – 80 Co – 10 Al_2O_3 – 10 Fe_2O_3 – 0.07 Na_2O
IV – 90 Co – 10 Cr_2O_3 – 0.05% Na_2O
V – 54 Co – 46 Al_2O_3 [60 (Co ppt'd 90 Co – 10 Al_2O_3) – 40 Al_2O_3] – 0.10% Na_2O
VI – 32 Co – 64 Filter Cell – 3 MgO – 1 ThO_2 – 0.09 Na_2O

Fig 2.



VII, VIII – 32 Co – 64 Filter Cell – 3 MgO – 1 ThO_2 – 0.50 Na_2O
IX, X – 90 Co – 10 Al_2O_3 – 0.10% Na_2O

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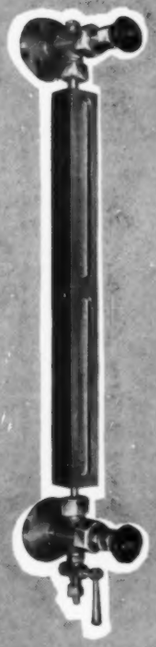

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In *2,765,357, J. K. Mertzweiller and J. L. Battles, Jr. of Esso Research and Engineering Co.* desulfurize the olefin charge to an Oxo reactor by using the olefins as a reaction medium for the alkali metal catalyzed copolymerization of butadiene and styrene. The copolymerization should take place at temperatures below 175°F; the sulfur is thereby reduced to less than around ten parts per million.

OXO REACTION CONDITIONS

A large number of patents were, of course, concerned with the conditions under which the carbonylation reaction takes place. In this section such patents are discussed.

The first group in this category deals with various Oxo catalysts, their preparation and advantages. *R. B. Mason of the Esso Research and Engineering Co. in 2,754,332* claims that the rate of formation of cobalt carbonyl Oxo catalyst is considerably increased and the induction period for the Oxo reaction itself is reduced by maintaining in the reaction zone a metal above cobalt in the Electromotive Force Series. Suitable metals are aluminum, iron, and magnesium. In *2,830,089 (to the Texas Co.) J. W. Fitzwilliam and F. J. Moore* propose a solid catalyst consisting of 50-95% by weight of cobalt (as the metal or oxide), 0.01-0.4% of an alkali metal oxide, and 5-50% of a promoter selected from the group made up from alumina, magnesia, chromia, titania, beryllia, calcium oxide, or mixtures of these materials. A mixture of cobalt sulfate and magnesium sulfate is proposed as a hydroformylation catalyst by *K. Büchner and P. Kühnel (2,763,694 to Ruhrchemie Aktiengesellschaft).* In *2,767,-048 (J. K. Mertzweiller to Esso Research and Engineering)* aqueous cobalt salts of cobalt hydrocarbonyl are made by treating aqueous solutions of divalent cobalt salts with hydrogen and carbon monoxide. The preparation is carried out in the presence of an inert, oxygenated organic solvent which is insoluble in water, at temperatures from 90°-180°C, and at elevated pressures. Suitable solvents are alcohols and aldehydes having at least four carbons. Under these conditions the aqueous phase contains the cobalt salt of cobalt hydrocarbonyl, $Co[Co(CO)_4]_2$. *W. Reppe, N. vonKutepow, W. Koelsch in 2,768,968 (to Badische Anilin- und Soda-Fabrik, Akt.)* propose to carbonylate olefins to carboxylic acids in the presence of water, an alcohol, or a carboxylic acid. Their catalyst comprises a complex salt of nickel or cobalt with a saturated, aliphatic carboxylic acid, containing 2-6 carbon atoms, and at least one substituent selected from the group of hydroxyl, keto-, or carboxyl groups. Suitable examples are lactic acid, 2-hydroxy-propionic acid, succinic acid, tartronic acid, and acetone dicarboxylic acid.

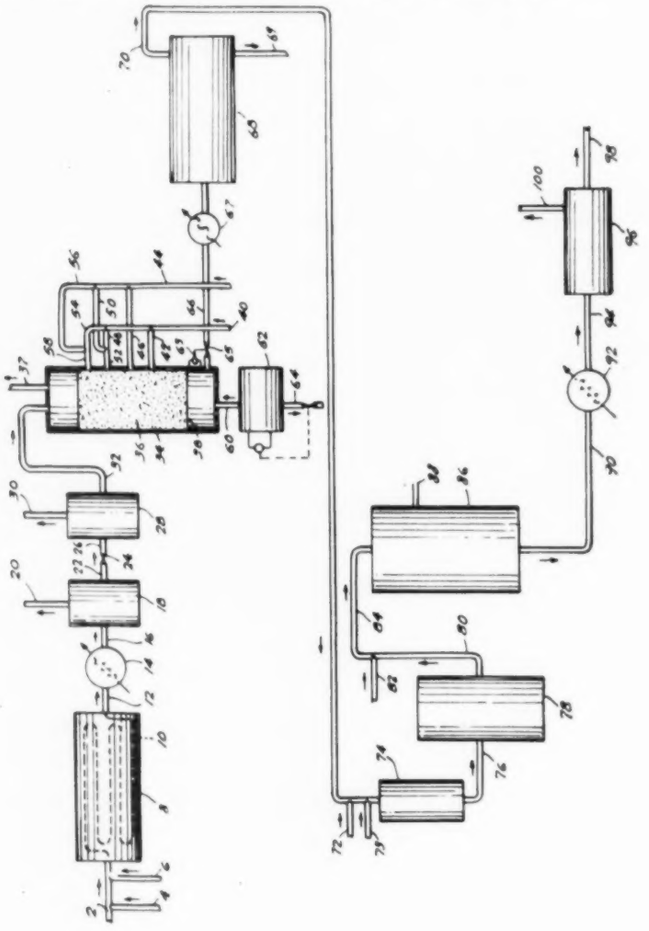
A somewhat different kind of Oxo catalyst is proposed by *E. A. Hunter and H. T. Baker (2,804,482 to Esso Research and Engineering).* These inventors mix nickel or a nickel compound with finely divided glass which is then compressed into pellets and sintered at 1100-1500°F.

A method to use cheap and convenient solid cobalt compounds as cobalt carbonyl sources is described by *C. L. Aldridge and E. V. Fasce of Esso Research and Engineering, in 2,812,356.* Reaction rates are usually slow when solid cobalt compounds are used; however, the rate is accelerated if the catalyst is solid cobalt oxide together with an organic acid having at least 2 carbons. The acid should be present in amounts necessary to provide a substantial increase in reaction rate, usually 1-6 moles of acid per mole of cobalt oxide. In *2,815,387 (to Imperial Chemical Industries) A. W. C. Taylor* generates cobalt carbonyl from precipitated cobalt at 120-140°C and 100-300 atmospheres pressure. The carbon monoxide partial pressure should be at least 30 atmospheres, and the reaction should be carried out in the presence of an olefin or inert solvent. The rate of generation of cobalt carbonyl is controlled by maintaining the hydrogen-carbon monoxide ratio at about 12/88.

Inventions dealing with the actual operation of the Oxo process will now be considered. *C. E. Starr, Jr. and E. M. Charlet of Esso Research and Engineering (2,734,-089)* propose to use the infrared absorption of the alcohol product at 5.8 microns to control the severity of hydrogenation of Oxo aldehydes. In *2,743,302 (B. H. Gwynn and J. H. Hirsch to Gulf Research and Development Co.)* olefins are carbonylated to produce mixtures of aldehydes, olefins, cobalt carbonyl, hydrogen, and carbon monoxide. This mixture is contacted with a bed of hydrogenation catalyst, selected from the oxides of chromium, manganese, copper, or cadmium, in order to hydrogenate the aldehydes. There is obtained a mixture of alcohols, olefins, and cobalt carbonyl; this last component may finally be removed and recycled. *W. E. Kennel of Standard Oil Co. (Indiana) in 2,744,939* proposes to distill the alcohol product from the Oxo process hydrogenation step until at least 10% is taken overhead. This overhead material is recycled to a flash distillation step which follows the decobalting step; such recycling insures that only low boilers are removed by the flash distillation.

A method of carbonylating olefins containing di- or polyenes is proposed by *P. G. Harvey and A. W. C. Taylor (2,752,396 to Imperial Chemical Industries).* These men

Fig. 3. Oxo Processing Steps: USA Patent 2,842,632 to B. H. Gwynn et al., dated July 15, 1958.



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first prepare the cobalt catalyst in inert organic medium by treating a dissolved organic cobalt compound at elevated temperatures and pressures with a carbon monoxide-hydrogen mixture in which the mole ratio CO/H_2 is at least $\frac{1}{5}$ and in which the carbon monoxide partial pressure is at least 50 atmospheres. The olefin mixture is contacted with this catalyst solution at 130-190°C and 200-300 atmospheres, maintaining the cobalt concentration greater than 0.1% (based on the olefin mixture) and the CO/H_2 ratio in the range $\frac{3}{7}$ to $\frac{2}{3}$. A less corrosive gas mixture is formed by this procedure and there is less inhibition by the polyenes. These same inventors propose, in *2,752,397*, to carbonylate alkene-polyene mixtures in two steps. In the first step the bulk of the feed is contacted with a carbon monoxide-hydrogen mixture in which the CO/H_2 mole ratio is $\frac{2}{3}$ and in the presence of not more than 0.3% cobalt catalyst, at 130-190°C, under 200-300 atmospheres. This is carried out until the reaction is established. In the second step fresh olefin mixture is charged to the established reaction together with carbonylation gas containing CO/H_2 in ratios of $\frac{3}{7}$ to $\frac{2}{3}$. The temperatures and pressures are the same as in the first stage; however, cobalt concentrations should not be more than 0.1%.

J. K. Mertzweiller, W. M. Smith, and K. E. Draeger in 2,757,202 (to Esso Research and Engineering) propose a method for using cobalt oxide, or other insoluble forms of cobalt, as a catalyst. The method comprises two steps; the first step involves treating 10-50% of the total fresh olefin feed with hydrogen and carbon monoxide over the cobalt compound at 2000-3500 psig, 150°-250°F, and a linear gas velocity of 0.004-0.01 feet per second. The residence time should be sufficient to convert the cobalt compound to cobalt carbonyl, but to effect no more than a minor conversion of the olefin feed. In the second stage the effluent from the first zone together with the rest of the olefin feed is passed into a second zone where it is contacted with hydrogen and carbon monoxide at 300°-375°F, 2000-3500 psig at linear gas velocities of 0.05-0.1 feet per second. The olefin conversion level is maintained at 70-80 mole percent. According to *R. W. Krebs and W. E. Catterall (2,768,974 to Esso Research and Engineering)* when the Oxo process is operated with recovered aqueous cobalt catalyst, the catalyst solution is quite dilute. These inventors propose a method of operation with such dilute solutions without flooding the reactor. The catalyst solution is added at a number of points along the reactor column in increasing amounts, corresponding to the increased water solubility of the mixture as more aldehyde is formed. The water concentration in the reactor is maintained between 1.3 weight percent at the olefin inlet to 16.7% at the outlet. In *2,779,795 (B. H. Gwynn to Gulf Research and Development)* a temperature control method is proposed for the Oxo process when carried out in elongated reactors employing indirect heat exchange. Such control is facilitated by recycling to the reactor 1-10 weight percent of the reaction product (based on fresh olefin feed). *H. Tramm, H. Kolling, F. Schnur, K. Büchner, H. Hager, and E. Stiebling (2,802,843 to Ruhrchemie Aktiengesellschaft)* carry out the Oxo reaction at 120°-220°C and pressures greater than 50 Kg/cm² by passing the olefin, carbon monoxide, hydrogen, and aqueous cobalt solution through a long, narrow reactor in the form of a low pitch helix. Flow velocities should be sufficient to cause turbulence and to prevent separation of the components. A "trickle" type Oxo process is suggested by *L. Paleari and A. Negromanti of Montecatini in 2,804,478*. Gas is supplied in approximately stoichiometric quantities, no recycle is practiced, and the only gas present in the effluent is that dissolved in the product. *R. Y. Heisler (2,816,931 to the Texas Co.)* obtains higher yields of C_{13}-C_{21} aldehydes from C_{12}-C_{20} mono-olefins (butene or propylene polymers); the increased yield of aldehyde is at the expense of alcohol production. The method comprises passing a mixture containing at least one volume of inert liquid diluent per volume of olefin through a reaction zone at space rates not below about 1.5 volumes per free volume of reaction zone per hour.

J. C. Snyder (2,710,879 to Hercules Powder Co.) makes carboxylic acids by reacting carbon monoxide with an alcohol, olefin, ether, or ester in the presence of an iron group catalyst plus a halogen. The reactor for this process should have an inner surface which is at least 90% zirconium. According to *K. Monkemeyer of Chemische Werke Huls (2,770,655)* branched chain aldehydes are made by reacting a tertiary alcohol with carbon monoxide and hydrogen over a cobalt catalyst. Temperatures should be in the range 100°-300°C and pressures from 200-1000 atmospheres; water should be present in amounts from 5-50 weight percent based on alcohol charged. In *2,790,832 H. J. Hagemeyer and D. C. Hull to Eastman Kodak Co.)* methods are suggested for directing the Oxo reaction to a desired isomer, i.e. a n- or iso-aldehyde. Among the methods claimed are recycle of the undesired isomer (or its dimer or trimer) and use of a solvent medium comprising added quantities of the acetal of the undesired isomer. In the specifications of this patent there is also proposed operation in a medium composed of a n- or secondary alcohol in order to form selectively the acetal of the n-aldehyde, whose derivatives will then predominate in the product. It is also possible to carry out the reaction in the presence of a lower aliphatic ketone to give predominant amounts of the normal isomer.

C. E. Morrell of Esso Research and Engineering Co. in 2,781,396 suggests that alcohols suitable for plasticizers may be made by oxoating propylene polymers, which are free of isobutylene polymers but which contain a minor portion of normal butene polymers. According to *2,790,006 (C. Bordenca to Newport Industries, Inc.)* dimethyl nonanals are produced by hydroformylating allo-ocimene and myrcene (pyrolysis products of alpha-pinene and beta-pinene respectively) in the presence of a hydroformylation catalyst at temperatures below 200°C. The product is predominantly 4,8-dimethyl nonanal. Olefins having "n" carbon atoms are converted to alcohols of "2n + 2" carbons according to *2,811,567 (R. Mason to Esso Research and Engineering)*. The carbonylation-dimerization takes place over a cobalt catalyst containing a zinc modifying compound present in amounts sufficient to substantially increase the yield of higher molecular weight products. The zinc may be in the form of a water soluble compound, zinc metal, or a water insoluble compound.

In *2,729,651 (W. Reppe, H. F. Worms, N. vonKutepow, and W. Morsch to Badische Anilin-und Soda Fabrik Akt.)* alcohols, ethers, or esters are carbonylated at elevated temperatures and pressures in the presence of a catalyst comprising a complex nickel compound with an organic quaternary halide. Suitable halides are ammonium or phosphonium halides and a typical complex is $[(CH_3)_4N]_2NiI_4$. *W. Reppe, N. vonKutepow, and E. Tetzenthaler in 2,734,913 (also to Badische Anilin-)* carbonylate alcohols to esters at elevated pressures and temperatures in the presence of a salt of cobalt or iron hydrocarbonyl, e.g. silver zinc, or cadmium salts, and a catalytic amount of iron.

TREATMENT OF OXO PRODUCTS

This section is devoted to those patents dealing with various treatments of Oxo products. Among the more important of such processes are decobalting, hydrogenation to alcohols, and decolorization. Many patents dealt with decobalting and these will be considered first.

Oxo aldehydes can be decobalted by extraction with acidic solutions. Thus, *J. K. Mertzweiller, H. E. Templeton, and R. L. Daussat (2,744,921 to Esso Research and Engineering Co.)* extract the aldehydes with aqueous organic acid to convert the cobalt to water soluble forms. The aqueous solution is then adjusted to pH 7 and oxidized with an oxygen containing gas to precipitate all the cobalt. The precipitate is then acidified to give solutions of divalent cobalt ions. *J. K. Mertzweiller of the same company in 2,751,403* contacts Oxo product with an aqueous solution of an organic acid at 150°-200°F in order to produce an extract containing divalent cobalt ion and $[Co(CO)_4]$. The aqueous extract is acidified and oxidized at 100°-150°F to convert all the cobalt to the divalent ion. Such a procedure obviates the necessity of handling solids. The acid used for acidification is a fatty acid which gives cobalt salts possessing sufficient solubility in olefins so that they may be used as Oxo catalysts, e.g. oleic, stearic, naphthenic. In *2,757,200 (T. G. Jones, M. C. Fuqua, and C. M. Downs, Jr. to Esso Research and Engineering Co.)* cobalt is removed from Oxo products by treatment with a non-aqueous solution of oxalic acid. Cobalt oxalate is precipitated and may be recycled to the hydroformylation section.

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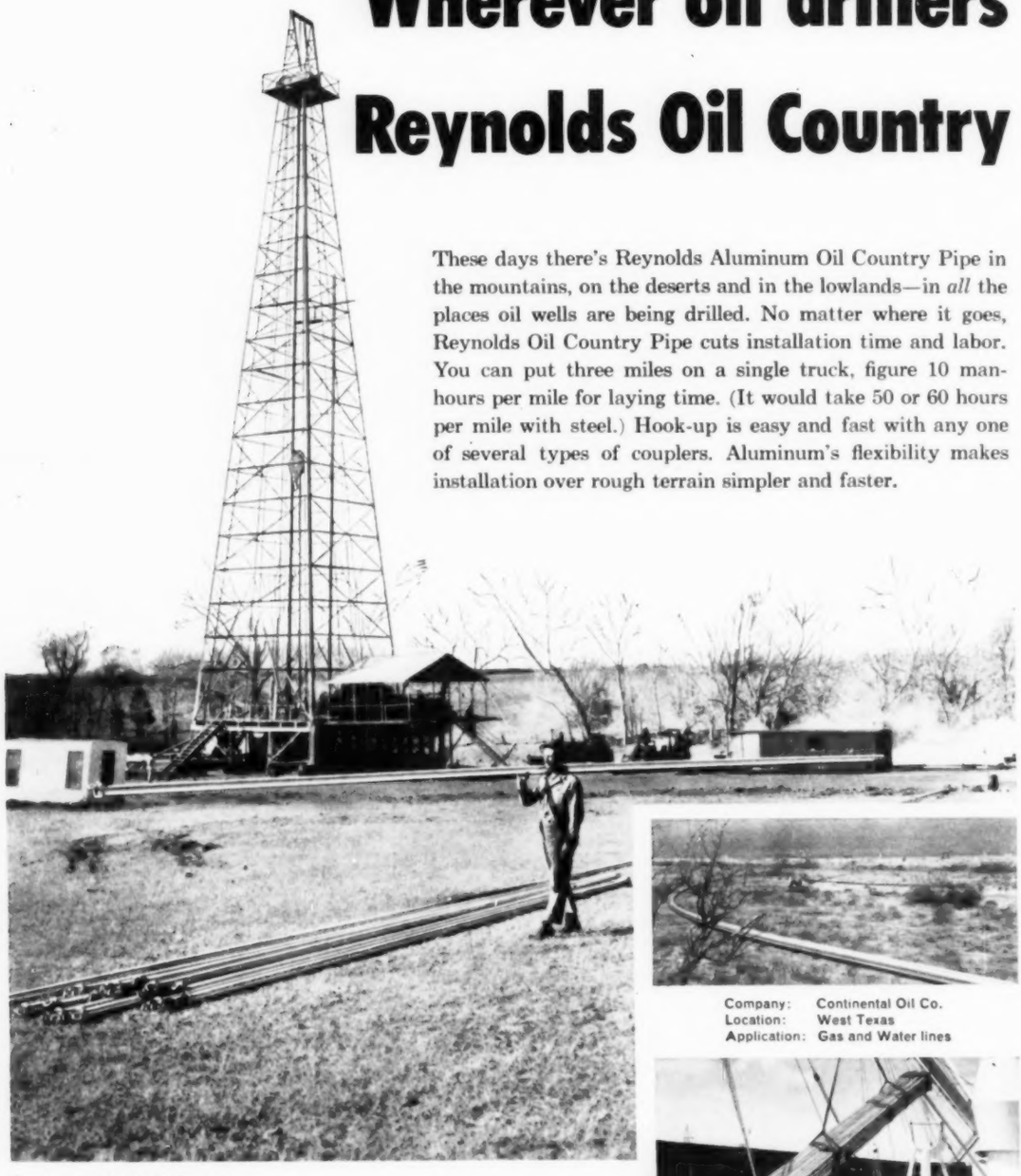

Company: Blanton Drilling Co.
Location: Houston, Texas
Application: Gas and Water lines

Company: Continental Oil Co.
Location: West Texas
Application: Gas and Water lines

Company: Penrod Drilling Co.
Location: Karachi, Pakistan
Application: Oil, Gas and Water lines

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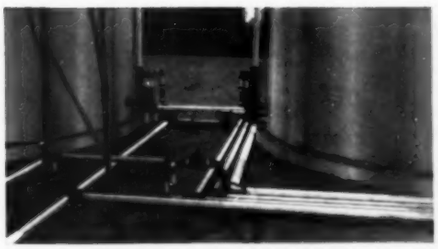
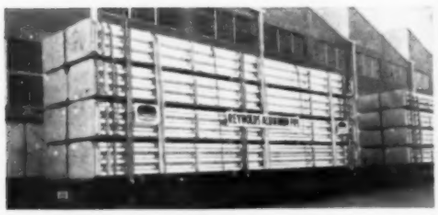


Company: Major Oil Company
Location: Citronelle, Alabama
Application: Tank Battery Hookup



Company: Colombian Petroleum Corp.
Location: Cucuta, Colombia, S.A.
Application: Crude Transmission

Company: General Petroleum Corp.
Location: Craig, Colorado
Application: Water Line

Company: Shell Oil Company
Location: Paradox Embayment
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W. F. Ratcliff, of the same company, in 2,757,204 claims to decobalt Oxo effluent by extraction with an aqueous solution of an organic acid whose cobalt salts are water soluble, e.g. formic or acetic acid. The extracted cobalt salts are separated and recycled. In *2,757,205, J. K. Mertzweiller and F. J. Buchmann also of Esso Research* propose to contact Oxo product with an aqueous organic acid which forms moderately water soluble cobalt salts. The extraction is carried out at 150°-200°F in an atmosphere of carbon monoxide containing synthesis gas at 10-150 psig. The cobalt is converted to water soluble forms, both cationic and anionic, which can then be recycled to the reactor. An improvement to the acid extraction is proposed by *T. G. Jones, G. P. Hamner, and M. C. Fuqua (2,757,206 to Esso Research and Engineering)* comprising water washing the extracted aldehydes at 250°-350°F. The phases are separated to produce an aldehyde product substantially free of cobalt. *J. K. Mertzweiller in 2,816,933 (to Esso Research)* proposes to extract the aqueous cobalt extract solution with a portion of the crude alcohol product. There is thus obtained an alcohol-cobalt solution and a cobalt depleted aqueous solution. The latter is recycled to the decobalting zone, while the alcohol solution is recycled to the Oxo reactor. The same inventor in *2,744,936* suggests the recovery of cobalt by extracting Oxo product with an aqueous solution of a cobaltous salt. The reaction postulated is as follows:

$$Co^{++} + 2HCo(CO)_4 \rightarrow Co\,[Co(CO)_4]_2$$

In *2,767,217 (J. E. Moise and J. K. Mertzweiller to Esso Research and Engineering)* cobalt carbonyl is recovered by contacting Oxo product with liquid water at temperatures below 350°F, pressures from 2000-3500 psig, and in the presence of carbon monoxide and hydrogen. There is recovered an aqueous solution of cobalt carbonyl and an aldehyde substantially free of cobalt. Again *W. E. Catterall of Esso Research in 2,779,794* heats Oxo product with liquid water under pressure at temperatures from 250°-500°F. The whole system is passed into a settling zone, water is added to keep the zone filled. Purified aldehyde is withdrawn from the top of the zone, an aqueous slurry of cobalt compounds from the bottom, and an aqueous stream from the middle of the settling zone. This last stream is recycled to the decobalting zone.

Decobalting methods other than extraction with aqueous solutions will now be considered. *S. H. Munger of E. I. duPont in 2,779,796* decobalts Oxo products by treatment with live steam, in which treatment contact is avoided with any fixed heating surface whose temperature exceeds the boiling point of the water-product mixture. Steam decobalting is also carried out by *B. H. Gwynn, R. W. Smyth, J. V. Ward (2,843,632 to Gulf Research and Development Co.)*. They carry out their process in the presence of calcium carbonate, whereby the metal is deposited on the calcium carbonate and corrosion of the demetalling zone is reduced.

C. E. Carter (2,721,136 to Gulf Oil Corporation) claims to demetalate Oxo products by passing them down a packed column countercurrent to steam at a temperature below that of decomposition of the carbonyl. Inert gas is introduced at an intermediate point in the column to cool and condense the steam. According to *W. E. Catterall of Esso Research Engineering (2,736,750)* Oxo products, before decobalting and separation of gas, are passed to a soaking zone maintained at 200°-300°F and elevated pressure. Any finely divided, solid cobalt is thus converted to cobalt carbonyl, enabling the product to be decobalted by conventional means. In *2,747,986 (B. H. Gwynn and W. A. Horne to Gulf Research and Development Co.)* the Oxo product is passed down through a column of combustible, porous, carbonaceous support material countercurrent to steam. The temperature is maintained at 70°F at the bottom of the column. Cobalt is deposited on the support which is thereafter burnt to recover the metal. *J. T. Harlan, Jr. of Shell Development Co. in 2,779,802* demetallates the product by passing an inert vapor through it at a temperature below the synthesis temperature but above 60°C. The contacting is continued for a time sufficient to produce a product free of dissolved cobalt and carbon monoxide. The inert gas may be methane or other saturated hydrocarbon. If ethylene or propylene are oxoated in an inert solvent such as toluene, benzene, etc., cobalt may be removed by aging according to *2,790,007 (J. K. Goerner and J. F. Bone to Jefferson Chemical Co., Inc.)*. Aging converts the cobalt to a water insoluble form; the reaction product is then extracted with water to remove the aldehydes and leave the cobalt in the inert solvent. In a patent assigned to *Gulf Research and Development Co. (2,815,390) B. H. Gwynn and C. W. Montgomery* further purify the products from a demetalling zone by passing them at 290°-380°C over a catalyst containing a Group VII metal. The final traces of cobalt carbonyls are destroyed before the charge enters the hydrogenation zone. *F. J. Moore (2,829,170 to the Texas Co.)* claims a cobalt precipitation method comprising contacting the product in the liquid phase at 200°-400°F over solid particles which are copper, at least on the surface. In the specifications of this patent it is given that suitable metals must have the close packed crystal structure and radii of 1.265-1.425A° for a coordination number of 12. Examples are zinc, ruthenium, osmium, copper, rhodium, palladium, iridium, and platinum. In a somewhat different approach *J. K. Mertzweiller of Esso Research and Engineering (2,841,617)* extracts the cobalt with a Werner complex of cobalt or nickel with ammonia. The cobalt catalyst is thereby precipitated.

Other treatments of Oxo products will now be considered. In *2,713,073 (W. M. Smith to Esso Research)* Oxo aldehydes containing sulfur are hydrogenated to alcohols over a sulfur resistant catalyst comprising a major proportion of charcoal supporting a minor proportion of molybdenum sulfide promoted with a minor proportion (based on molybdenum) of combined phosphorus. Sulfur impurities are removed from C_4-C_{12} Oxo alcohols according to *R. C. Doeringer and C. S. Carlson (2,713,075 to Esso Research)* by contacting them with a solid metal oxide at 25°-180°C in order to render the impurities harmless. Suitable oxides are mercuric oxide, manganese dioxide, and lead monoxide. *B. F. Crowe of the Texas Co. (2,743,212)* converts Oxo products to alcohols and acids by subjecting them to the action of acetobacter micro-organisms in a nutrient medium. At 50°-125°F the disproportionation takes place either aerobically or anaerobically.

Acetals in Oxo products are hydrolyzed according to a patent by *C. H. Hale (2,757,203 to Esso Research)*. The products are charged to a steam distillation-hydrolysis zone at 15-250 psig, 212°-400°F, and in the presence of dilute phosphoric or sulfuric acid. The acetals are hydrolyzed, the aldehydes steam distilled overhead, and the cobalt carbonyl is decomposed. *K. Büchner of Ruhrchemie Akt. (2,758,136)* decolorizes Oxo aldehydes by washing them with non-aqueous solutions of oxalic, succinic, or citric acid. Suitable solvents are aliphatic alochols having 1-3 carbon atoms. In *2,763,693 (J. C. Vander Woude and P. M. Morris of Eastman Kodak Co.)* aldehyde products from oxoation of C_2-C_6 olefins in alcohol medium are separated from the solvent and high boiling products by azeotropic distillation. The solvent is separated from the high boilers by distillation, and the latter are hydrolyzed to aldehydes and alcohols. *N. C. Hill (2,768,201 to C. P. Hall Co.) produces* dicarboxylic acids from Oxo products having at least four carbons. The product is first separated into water soluble and insoluble fractions. Hydrocarbons are separated from the latter fraction by solvent extraction, and the oil soluble, oxygenated material thus obtained is oxidized to produce the dicarboxylic acids. According to *2,802,846 (J. K. Mertzweiller to Esso Research)* Oxo alcohols are distilled, an overhead fraction is taken, and the bottoms are contacted at 300°350°F with alkali, converting a portion to a fatty acid salt and the rest to an alcohol. The salts may then be converted to cobalt salts for recycle to the Oxo reactor.

R. B. Mason and F. J. Buchmann of Esso Research in 2,767,222 hydrodesulfurize Oxo alcohols at pressures from atmospheric to 3000 psig and temperatures from 100°-400°F. When carbon monoxide is contained in the hydrotreating gas, metal carbonyls are formed from the metal catalyst; these carbonyls must be removed from the alcohol product and the metal recovered. The liquid products from the hydrodesulfurization are stripped at 50°-400°F and at pressures from atmospheric to 500 psig in order to remove the carbonyl. The stripping gas is thermally treated at 400°-800°F to decompose the carbonyl. END

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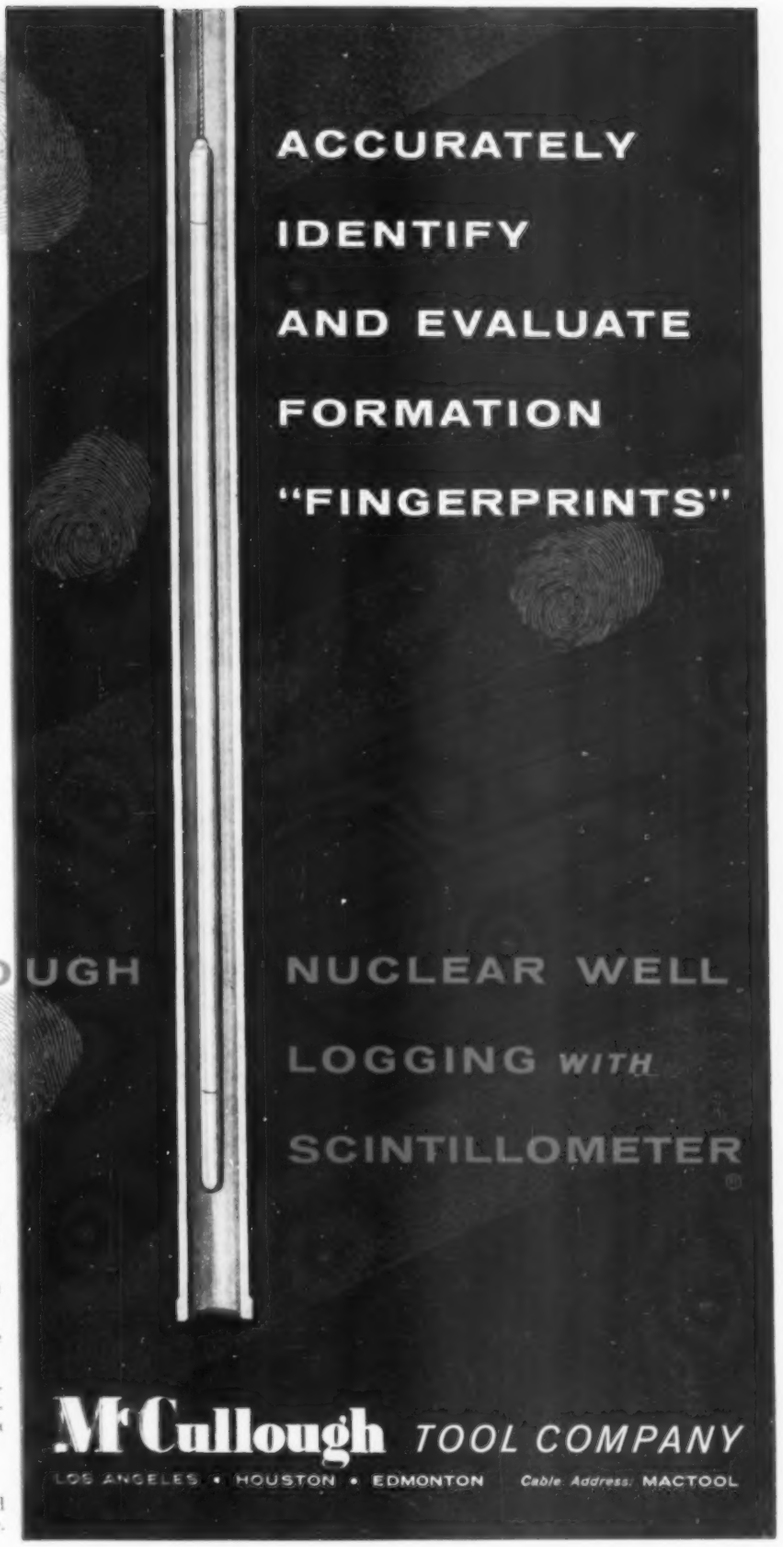

THE MOLASSE ZONE OF AUSTRIA

by Dr. R. Janoschek
Exploration Manager, Rohoel-Gewinnungs, A.G.

I. *General Boundaries*

The second most important oil-prospective, and since May 1956 again oil-producing geological unit inside Austrian territory, is the Alpine and Carpathian foreland, also called Molasse zone. The latter strikes through the northern part of Austria from the German frontier along the Rivers Salzach and Inn in a west-eastern direction as far as into the St. Pölten area where it turns to northeast and continues north of Laa on Czechoslovakian territory. The rolling country of the Molasse zone is bounded on the northwest, north, and northeast by the crystalline basement of the Bohemian massif, on the south by the mountain ranges of the Alps, and north of the Danube by the southwestern spurs of the Carpathian Mountains.

II. *Geological Architecture (Fig. I and II)*

A. *Sequence of Strata:* According to our present knowledge, the Molasse zone in Austria is made up of the following members:

a. *Basement:* The basis of the Tertiary sequence of strata of the Molasse basin is formed—up to the overthrust front of the Alps and Carpathians—by granites and gneisses of the Bohemian massif. In certain areas, these are overlain by deposits of Paleozoic (Carboniferous) and Mesozoic (Upper Jurassic and Upper Cretaceous) age.

b. *Tertiary Basin Sediments:* Unconformably overlying the Cretaceous, Jurassic, and crystalline series is, as oldest member of the Molasse sediments, the richly divided Upper Eocene; dark gray marls, with the big foraminifer Discocylina abundant in individual layers, shales partly rich in Molluses, sandstones containing gray Nummulites, and nullipore limestones (algal limestones). At the base of the Upper Eocene there are often partly varicolored limnic clays and clay stones with several coal seams up to 60 cm thick. The total thickness of the Upper Eocene amounts to 25 to 90 meters according to the deep wells so far drilled in the area between Braunau and Attnang.

The bulk of the Molasse trough is made up of gray, well bedded shales with sandy films, which in Upper Austria as a local term are called schlier; intercalated in those shales are more or less thick layers of sands, sandstones, and gravels. The stratigraphic division of that complex of strata which, in the main trough zone is several thousand meters thick, is chiefly made micropaleontologically, i.e., on the basis of the foraminifera fauna, due to the predominantly uniform petrographic development of its sediments. It was only in few localities that there were obtained also more abundant macrofaunas (Molluscs and mammal remains) which permit of an age determination of the relative beds. According to their fossil content, the individual members, which are often called by their local names, are to be assigned to the Upper Eocene, Oligocene (Lattorfian, Rupelian, Chattian) or to the Lower and Middle Miocene (Aquitanian, Burdigalian, Helvetian).

Unconformably overlying that predominantly marine-brackish sequence of strata is, in the western part of the Molasse trough, the upper freshwater Molasse which represents the Tortonian, the Sarmatian, and the Lower Pliocene and, in individual areas, contains lignites of exploitable thickness. In the eastern and northeastern part of the Molasse trough, in the outer alpine Vienna basin, the Oligocene to Helvetian sequence of strata is likewise unconformably overlain by marine deposits of the Tortonian, brackish deposits of the Sarmatian, and semi-brackish or freshwater deposits of the Lower Pliocene. These have been preserved only in a few erosional remnants, particularly in the southern part of that area.

The youngest member is formed by the Quaternary deposits—moraines, terrace gravels, and loess.

B. *Structures:* In the course of the migration of the Alps and Carpathians to the north, the southernmost and easternmost parts of the Bohemian massif, under the tremendous load of those two mountain bodies, gradually subsided towards depth, with intensity increasing to south and east. In Upper Eocene, Oligocene, and Miocene time, there existed between the two big tectonical units of the Bohemian massif, on the one hand, and the Alps and Carpathians on the other, a sedimentation trough gradually migrating to north.

In line with its origin, the Molasse zone shows an asymetric architecture. The basement, the crystalline of the Bohemian massif, and the overlying Mesozoic plunge towards south to increasingly greater depths. Therefore, on the north, where the subsidence movements caused by the alpine thrust had the least effect, the Tertiary sediments are only few tens of meters thick; whereas on the south, in immediate vicinity of the alpine overthrust front, they reach their maximum thickness of about 4,000 meters.

Depending on the tectonical stress on the Molasse sediments during the last alpine movements, distinction is made between a folded and an unfolded Molasse.

The unfolded Molasse takes up the largest part of the Molasse zone and, in individual areas, reaches the alpine overthrust front. In the immediate contact area, the individual Tertiary members are steeply uptilted and dip north at an angle of about 70°. However, in the distance of a few hundred meters from the overthrust front, those members show flat bedding.

At the base of the Aquitanian and Burdigalian, there exist major surfaces of discontinuity. Therefore, the surface structure of the Miocene complex of strata does not permit drawing conclusions as to that of the deeper Oligocene, which is of great importance for the exploration of oil-prospective structures. In the southern part of the Molasse zone, the Oligocene complex of strata—similar to the crystalline of the Bohemian massif and the Mesozoic—plunges to south under the northernmost ranges of the Alps. Therefore, the Oligocene complex of strata is thickest within the zone of the alpine overthrust front. The Miocene, on the other hand, rises towards south and pinches out completely as, e.g., in the area of Bad Hall. Therefore, in the southern part of the Molasse trough, the Oligocene-Miocene complex of strata shows a fanlike architecture diverging to the south.

In other part-areas, however, the Molasse sediments during the last alpine movements were pretty much affected tectonically, sometimes in a distance of up to several kilometers from the alpine overthrust front.

Fig. I

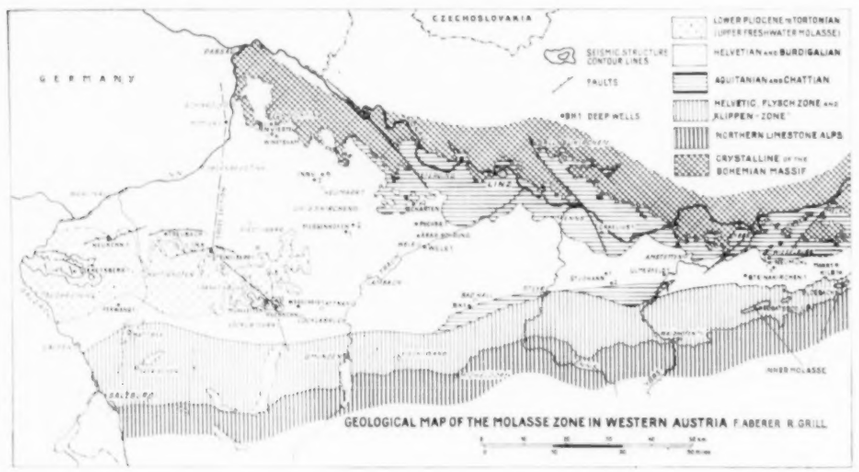

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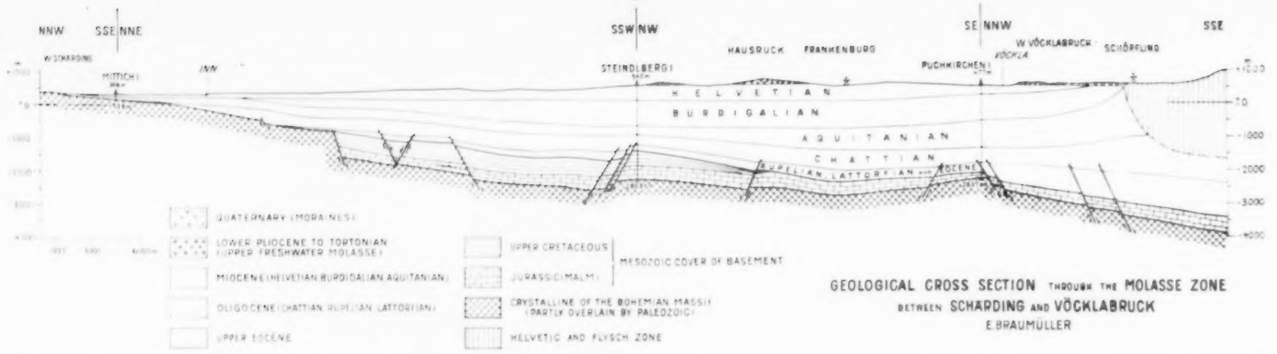
Fig. 2



GEOLOGICAL CROSS SECTION THROUGH THE MOLASSE ZONE BETWEEN SCHARDING AND VÖCKLABRUCK
E. BRAUMÜLLER

In Switzerland, in Vorarlberg, and in Bavaria, the southern part of the Molasse zone—the folded Molasse—consists of several trough zones separated by steep fault planes. Of a similar architecture is also the southernmost part of the Molasse zone in the areas of Bad Hall and Neulengbach. North of Mattsee, the deep well Perwang 1 encountered, under the flat-bedded Miocene, an imbricated zone consisting of several Oligocene, Upper Eocene, and Cretaceous complexes overthrusting each other; after penetrating a little disturbed Oligocene to Upper Eocene complex of strata, it was discontinued in terrestrial deposits of probably Triassic age at a depth of 3,528 meters as the deepest well so far drilled in Austria.

Our knowledge about the structure of the Molasse zone in the area between the two rivers Salzach and Enns was essentially widened by the extensive explorations of Rohoel-Gewinnungs A.G. Regional mapping of that area in a scale of 1:25,000 and, above all, years of reflection seismic surveys ascertained that the Miocene layers are very flat-bedded; within the latter, no major faults have so far been proved. However, the Upper Eocene and the deeper Oligocene are dissected by numerous faults whose vertical throws are 200 to 300 meters in places, but diminish towards the top. Up to now, it has not been possible to trace those faults also into the Miocene. They are mostly striking in a west-east or northwest-southeast direction and dip partly to the south, partly north. Thus it was possible to ascertain in the Neukirchen-Aspach area a major north-dipping fault. Another fault system extends between the villages of Mattighofen—Lohnsburg—Waldzell, in whose area the productive well Steindlberg 1 is situated. Moreover, there, several high zones were proved such as the continuation of the Landshut-Neuötting ridge (in Bavaria) in the Weilhart Forest, and another high zone immediately north of the Vöcklamarkt-Attnang railroad line, with the producing well Puchkirchen 1.

In the eastern part of the Molasse trough, in the Tulln basin and in the outer alpine Vienna basin, the structures are chiefly due to northeast-southwest striking faults. There should be mentioned here the Hiesberg fault—distinctly conspicuous in the landscape—east of Pochlarn, and the Mailberg downthrow zone which separates the western, shallow part of the outer alpine Vienna basin from an eastern deep part where the thickness of the Tertiary sequence of strata is more than 3,000 meters. The western block seems to have been flooded by the sea in Lower Miocene time only, as is borne out by the Mailberg well with a total Tertiary thickness of 360 meters, and by the Absdorf well with a total Tertiary thickness of 400 to 1,000 meters. On the southeast, the Molasse zone, similar to what is the case in Western Austria, is bounded by a steeply southeast-dipping overthrust plane along which the Helvetian deposits of the Waschberg zone, the extreme margin of the Carpathians, are overthrust.

III. *Oil and Gas Accumulation*

For many decades, noteworthy oil and gas indications have been known in the Molasse zone of Austria. Thus, as early as 1891, the Wels gas reservoir and, in 1906, the Leo-prechting heavy-oil reservoir were proved by artesian water wells. Besides, reference should be made to the gas shows in the Bad Hall iodine water well.

In spite of exploratory operations which continued for several decades and, at times, were rather intensive, it was only in 1956 that a commercial production was obtained, viz., from deep well Puchkirchen 1. The explorations carried out until 1945 covered predominantly the northern part of the Austrian Molasse zone, in which the deeper Oligocene and the Upper Eocene are missing. It was only through the use of a modern American reflection seismic unit since 1951 that Rohoel-Gewinnungs AG could clarify the tectonics of the deeper Molasse trough and prove structures in the deeper Oligocene and Upper Eocene.

The deep well Puchkirchen 1, which had been drilled on a structure delimited more closely by seismic detail surveys, penetrated from 2,581 to 2,583 meters in Upper Eocene a 2-meter-thick oil sand from which the well has produced since May 27, 1956. The initial daily production rate amounted to about 30 tons by natural flow. Since December 1956, the well has been pumping at a daily rate of 12 to 15 tons of water-free oil. Cumulative production until December 31, 1958, amounted to 11,470 tons of clean oil. The oil is paraffinous, and its specific gravity is 0.854. The well Puchkirchen 2 drilled north of the discovery well, on a block separated by a fault, encountered only oil shows in the same beds.

Well Wegscheid 1, drilled east of Puchkirchen on a separate high of the same anticline, recovered from the same beds by pumping operation a daily production of only 0.6 ton, and thus was shut down.

Well Steindlberg 1, situated northwest of Puchkirchen at an antithetic fault, has been pumping since September 1958, likewise from Upper Eocene, section 1,909.5 to 1,913.5 meters, about 10 tons of water-free oil of a quality similar to that of Puchkirchen 1.

All other wells, viz., Geretsberg 1, on an anticlinal structure; Perwang 1, within the imbricated zone N of Mattsee; and Neukirchen 1 and Treubach 1 at the Neukirchen-Aspach fault, were dry.

In that part of the Molasse zone which lies east of the Enns River, OeMVAG this past year carried out extensive geophysical operations (telluric, gravimetric, reflection seismic surveys) and, in 1958, started drilling the first deep wells. Moosbierbaum 1, situated west of Tulln, encountered remarkable oil shows in boulder beds at a depth of 44 to 105 meters. The consecutive well Moosbierbaum 6 tapped, in the upper part of the Melk sand, at about 320 meters, natural gas under a pressure of 32 atm. Southeast of Laa-Thaya, Staatz 1 is being drilled.

In the entire Molasse zone of Austria there are presently producing only the two wells Puchkirchen 1 and Steindlberg 1, with about 25 to 30 tons of crude oil per day. Moreover, some gas wells in the town of Wels produce about 80 million cubic meters of gas per day.

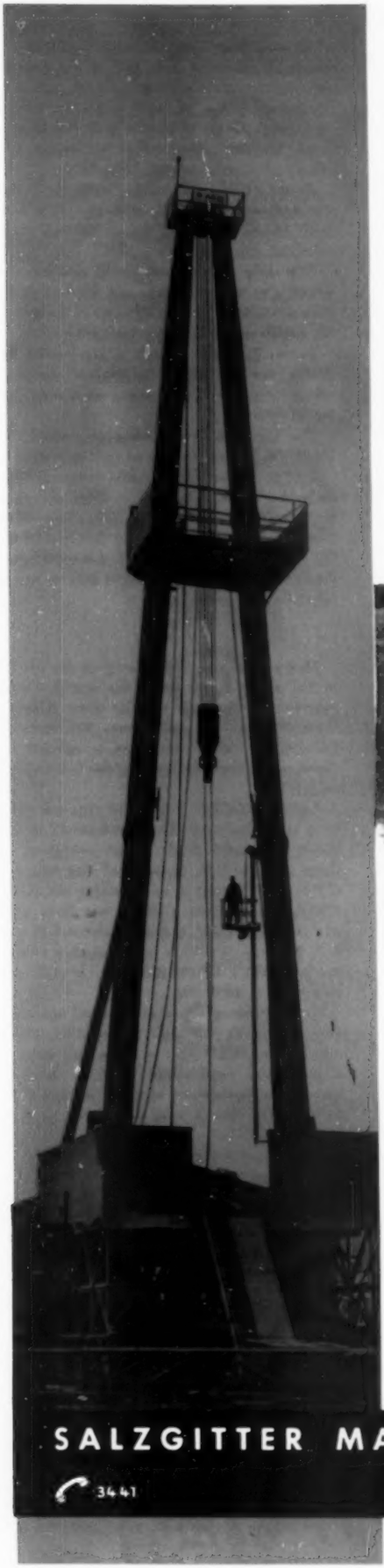
IV. *Exploratory Activity*

A. *Geophysics:* In the Molasse zone, extensive reflection seismic surveys are presently being carried out, viz., west of the Enns River, by a crew of Rohoel-Gewinnungs AG (Magnolia unit with Failing drilling rigs) and, in the less thoroughly surveyed part east of the Enns River, by four crews working for OeMVAG (two OeMVAG and two Prakla crews).

B. *Deep Drilling:* Four deep drilling rigs are presently being used, viz.: In the western Molasse zone, two rigs of Rohoel-Gewinnungs AG (one heavy Ideco rig Hydrair 7-11-110 for depths to 4,000 meters, and one Ideco rig Unit-15 with Full View Mast, for depths to 3,500 meters); in the eastern Molasse zone, two rigs of OeMVAG.

The deep wells Puchkirchen 1 and Steindlberg I have proved that the Molasse zone is oil-bearing. Further extension and, above all, costly explorations will show whether there exist also in the Austrian Molasse zone, similar to the Vienne basin, any major commercial oil and gas reservoirs.

END



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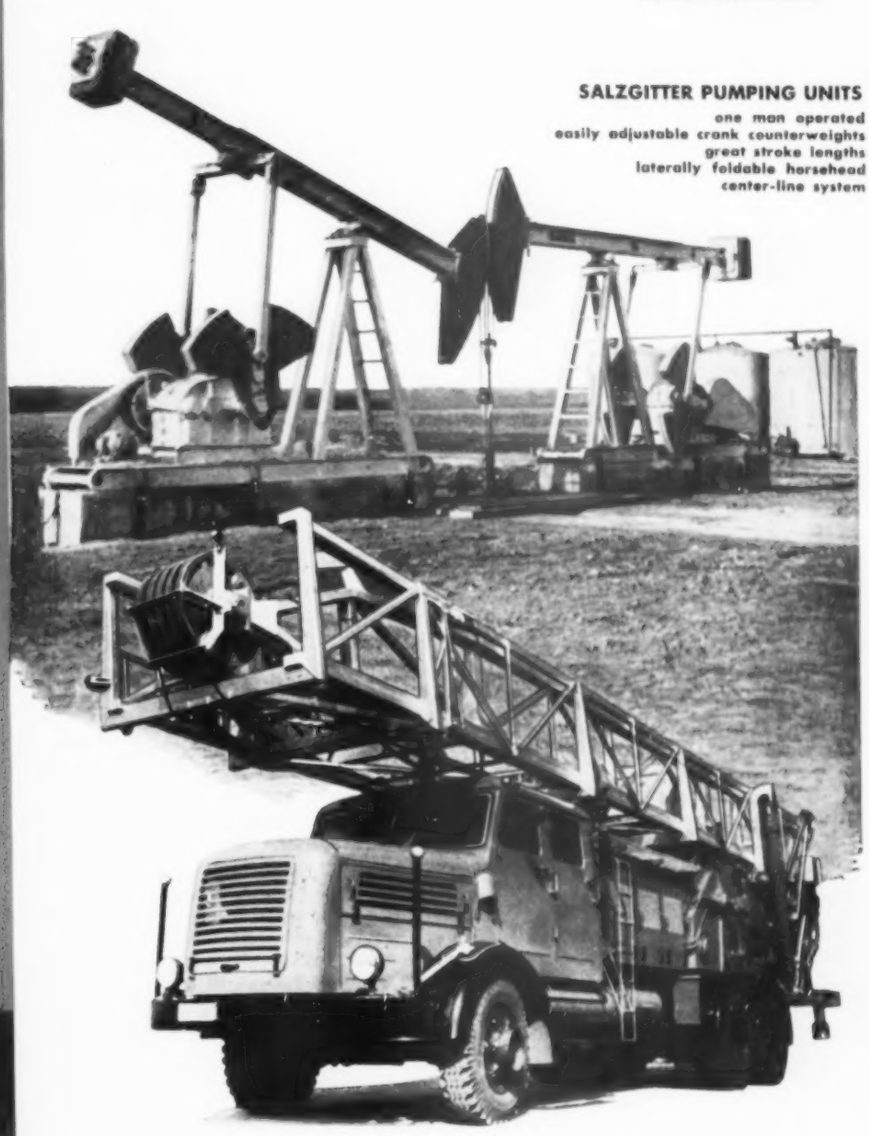

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World's Wildcats Reviewed

(Continued from page 49)

with six rigs in operation. Four are drilling in the Qum region—three on the Alborz structure and one on the Saradjeh structure, 30 miles southeast. Another rig is drilling in the Manzandrian plain south of the Caspian. The consortium is operating nine rigs.

Iraq: A number of wells are drilling in Iraq. No discoveries have been reported. Two British-made rigs capable of drilling to 12,000 ft are being assembled on behalf of Basrah Petroleum for the Rumaila oil field in southern Iraq. The first of the new wells were expected to be spudded-in about mid-August.

Iraq Petroleum Co., Ltd.—In January four wells were drilling—Kirkuk 124, Bai Hassan 13, Pulkhana 5 and Gilabat 1. K.124 was completed at 2,507 feet in January and K.125 was spudded the following month.

In March a six-string programme was operating: K.126, K.127 and Jambur 12 were spudded during that month.

In May K.126 was completed at 2,694 feet, and on the 18th K.128 was spudded.

At the end of June the six-string programme was continuing (four Company strings and two Drilexco). K.127 was completed at 3,021 feet in June and K.129 was spudded on the 21st.

Depths at the end of June were:

K.128	2,780 feet
K.129	956 feet
Bai Hassan 13	4,277 feet
Jambur 12	5,635 feet
Pulkhana 5	8,764 feet
Gilabat 1	6,457 feet

Basrah Petroleum Co., Ltd.—The year began with two wells drilling, Samawa 1 and Rumaila 21. In March, Tuba 1 (mid-way between Rumaila and Zubair) was spudded; it was drilling at 7,585 feet on the 30th of June. In June three wells were drilling, Tuba, 1, Romaila 21 (at 11,555 feet) and Samawa 1 (at 11,237). A new location is being prepared to drill at Kifl, south of Baghdad and some ten miles south from Hilla.

Mosul Petroleum Co., Ltd.—In January three wells were drilling, Anah 2, Khleisia 1 and Ain Zalah 22. In March, Anah 2 was abandoned at 11,573 feet. Khleisia 1 was abandoned in May at 12,438 feet. At the end of June Ain Zalah 22 was the only well drilling; it had reached a depth of 5,462 feet. A new location has been prepared and rigging up is approaching completion at Samarra. The location is some fifteen miles north of Samarra town, northwest of Baghdad.

Israel: The first encouragement in northern Israel was found in the Deborahl well, west of Mount Tabor. The well is being drilled by the Israel Continental Oil Co. Oil was contained in fractures of a core of compact limestone of the Jurassic period taken at a depth of 2,550 ft. This is the sixth deep test hole drilled by Israel Continental.

Other tests being drilled in the country, as of March, 1959, were as follows: Kurnub #2—A gas test, drilled with air by Pan-Israel, Israel-Mediterranean, Denver-Golden and PEC. Projected depth—1,200 ft.

Makhtest Katan #1—Being drilled by Israel National Oil Co. on Negev surface structure. Projected depth—3,000 ft.

Zohar #2—Being drilled by Naphtha, Israel Petroleum Corp. Ltd. This is a one kilometer stepout from Zohar #1 which had a good gas show at about 3,300 ft. This is a Negev surface structure and Zohar #2 is projected to 4,000 ft.

Halutza #2—Being drilled by Naphtha, Israel Petroleum Corp. Ltd. to earn a 50% interest in acreage owned by Israel American Petroleum Corp. The well is just getting started. The structure is in the Coastal Plain and was outlined by reflection seismograph by the Pan-Israel-Israel-Mediterranean crew who acted as contractor. Projected depth is about 8,000 ft.

Jordan: Phillips Petroleum Co., which is operating the Pawley concession, has reportedly extended its concession over ⅔ of the country from a former area of ⅓ and is now on Jordan's sixth wildcat. The last was in the Ghaur valley, abandoned at 3,600 ft with no shows.

Kuwait: Kuwait Oil Co. is testing its exploratory discovery, Minagish, 21 miles west of the Burgan oilfield, which tested about 34.5° API gravity oil at nearly 10,000 feet, and a 5-ft. perforated interval produced 1,660 b/d through a ⅝-in. wellhead choke with a flowing pressure of 600 psi. Sulfur content is 1.90% wt. The well is being deepened to investigate production possibilities in the underlying Arab Zone limestones.

Two other wells are drilling by KOC. Dibdibba 1, approximately 25 miles northwest of Minagish 1, was spudded July 27 to explore deep horizons indicated by seismic survey. Mutriba 1, in north Kuwait about 28 miles west of Raudhatain, was suspended in February 1958 after reaching 10,700 ft. Operations were resumed in July 1959 to explore horizons below the Zubain formation.

Lebanon: No drilling is going on in Lebanon now, but Cie. Libanaise, the only concessionaire, has reached an operating agreement with a German concern, Gewerkschaft Elwerath, which will entail exploratory drilling year.

Muscat and Oman: Cities Service continues to use one rig in the Dhofar area, attempting to find a field among the many possible structures that combines all a good field should have. Ahbout 1 is now drilling.

IPC has shut down its Ghaba wildcat and is drilling another to the southeast, Haima No. 1, 120 miles southwest of Ghaba.

Neutral Zone: No exploratory drilling is being done onshore by Getty Oil or Aminoil. Offshore, the Japanese-owned Arabian Oil Co. is drilling a well in about 75 ft of water. Its location is two to three miles directly north of the intersection point of a line perpendicular to the trend of the coast (which is northwesterly) and a line along the axis of the Safinayah field. The distance from the coast is approximately 24 miles. Drilling is now suspended due to a gas fire.

Qatar: The only wildcat drilling is a much-deliberated deep test on the Dukhan structure, below 10,000 ft as of mid-July. It may go below 16,000 ft to test formations not yet known. If dry it will be plugged back and completed as an expensive producer from established horizons.

Saudi Arabia: Among the wildcats drilling by Aramco is the Khurais No. 4, a deep test which extended the field two miles north of the discovery well.

The only exploratory well drilling, according to the company, is a wildcat in the Rub-al-Khali (Empty Quarter). No details on depth or results are available.

Syria: The government is reportedly operating the rigs left by the Menhall company when its exploration licenses were cancelled for violations.

The German firm, Concordia, owned by Deutsche Erdoel, has three rigs operating.

Turkey: About 12 rigs are running. They include Esso, Socony, Turkish Petroleum Corp., Gilliland Oil, Tidewater, Shell, Bolsa Chica and, later this year, Gulf Oil. Only Caltex (through Amoseas) has made a discovery so far, that was of heavy oil at Kahta.

Africa

This continent, particularly in the north, is the coming oil area of the world. Libya promises to be big and so does Algeria. Something may result from the Spanish Sahara, as well, when that is opened up (companies are now waiting for bid awards on it).

Algeria: (OCRS): Some 40 rigs are running in the country. They include 17 in the Hassi Messaoud field, about one-third of them are by S.N. Repal and the rest by C.F.P.(A) Two rigs are drilling at Hassi R'mel, the gas field. CREPS has three rigs at Zarzaitine. CREPS has announced it will drill 90 wells in 1959, a large number but in the company's Edjele discovery a well can be drilled in 10 days.

The government has announced ten new concessions—first since Aug. 30, 1958. They cover about 10,370 square miles, and call for a minimum investment of 6,570 million francs, the equivalent of $13.4 million U.S. dollars. The leases run for three to five years.

Largest concession was to a consortium of three companies in which Standard Oil Co. (N.J.) has 50% interest. This is the first and only concession in the Sahara in which an American company has been granted as much as a 50% interest. Other international companies participating in new concessions are Sinclair Petroleum Co. and Newmont Mining Co.; Phillips Petroleum Co. of France, 25% owner of a concession of 600 square kilometers of five years, with minimum investment of 170 million francs; British Petroleum Co., 44% owner of each of three concessions of 100, 200 and 1,500 square kilometers, with minimum investments of 25 million francs, 50 million and 500 million francs respectively.

C.R.E.P.S. (July 22) *Edjeleh*: 153 and 154 completed on 3 and 5 July. 155 started on

"The tendency for governments to exert more and more control over business affairs affects the ability of all private investment to serve people and earn a proper return. Often such actions have results beyond those intended, to the detriment of investors, consumers, and free world prosperity and security."

—*From the 1958 Annual Report*

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July 18 and reached 377 meters on 22nd. *Zarzaitine:* 37 was completed on July 13 at 1,375 meters in Lower Devonian. 38 started on July 18 reached 485 meters in Carboniferous (1,150 on 28th). *Zr.32* was completed at 1,496 meters July 28. *Gour Tiedou 1:* 2,396 meters on July 28 in lower Cambro-Ordovician. After completing this well, the rig will be moved on to Quan Taredjeli, N.N.E. of Zarzaitine, to spud a new wildcat. *Issaouane Nord-Est:* Crossed clays of Upper Divonian and has begun core-drilling and testing at 1,340 meters, in Lower Devonian. Depth on July 27 was 1,483 meters. *In Akamil 1:* Reached Ordovician around 2,665 meters; depth on July 28 was 2,811 meters. *Quan Taredert 3:* Depth reached on July 28, 1,632 meters. In Edjelih and Zarzaitine 3 to 4 wells are being drilled each month on each structure.

Ste. Nationale des Petroles d'Aquitaine (S.N.P.A.) (July 21): *El Gassi permit: Hassi-El-Gassi No. 2:* 2,806 meters in clays of the Dogger. *El Agreb No. 1:* Reached 2,568 meters under the intercalary continental in the (probaly) Jurassic series, entered at 2,074 meters.

Cie des Petroles d'Algerie (RD Shell)—(July 20): *El Biod Permit: Hamra 2* Still being tested. *Azzel 1:* A new well, starting on this date. *McMahon Permit: Hassi Ramedj 3:* Reached 3,036 meters in sandstones of external Tassili. *Hassi Keskes 1:* 3,462 meters in sandstones of internal Tassili. *Hassi M'Segguem Permit (S.18): Baguel 1:* New well, about to start drilling. *Cie. D'Exploration Petroliere: Hamada du Tinrhert Permit: Ouine Eslak 101:* At 2,445 meters in clayous cements with sandstones of Upper Devonian—Core Drilling 5 15 16-fluorescent shows. *Hassi Tabenkort 1:* Stopped July 1 at 2,710 meters in sandstones on top of Cambro-Ordovician. *Gazelle 102:* Located in center of the Hassi-Moulaye Permit, a new well about to start.

COPEFA: Hassi Touareg El Morr Permit (joint venture with Omnirex, 37.5% and Phillips Petroleum [France] 25%): *Hassi-Touareg 1:* 1,548 meters on July 20.

SAFREP: Erg Bourarhet Permit: Erg Bourarhet 1(BT 1): 1,488 meters in sandstones of Devonian on July 20. Tests from F.3 and F.4 reservoirs yielded only water. *Frandel Franco Delhi:* Seismic reflection conducted on permit Daiet El Habs. No drilling yet.

Cie Francaise Des Petroles (Algerie) (as of July 21): *Hassi-Goumied Permit* (Hassi Messaoud oilfield): *Onm 75:* Reached 3,587 meters in the Cambrian after crossing the reservoir R.I. Producive. *Omo 13:* Reached Cambrian at 3,337 and arrived at 3,341 meters. 7" casing was placed at this stage. *Oni 75:* 3,410 meters in clayous sandstones of Trias. *Omk 31:* 2,312 meters in Jurassic. *Onm 13:* 2,392 meters in Jurassic. *Omm 17:* Deviated, reached 3,392 meters in the reservoir. *Djama Permit: Ph 1:* 3,633 meters in the Trias. *Laghouat Permit: Li 1:* 2,112 meters in Jurassic. *Ouargla Permit: Ol 1:* 1,940 meters in top of Jurassic.

S.N.REPAL (July 20): Hassi-Messaoud Permit: Md 16: Being completed at 3,405 meters. Producer. *Md 21: Non-producer.* Stopped at 3,637 meters. *Md 22:* Completed July 13 at 3,443 meters. *Md 23:* Coring at 3,535 meters in Cambrian with quartzites. Producer. *Md 24:* Reached 3,344 meters in the Cambrian with the quartzites. *Md 25:* Reached 2,505 meters in Middle Jurassic. Two more wells about to begin: Md 26 and Md 27. *Berriane Permit:* Oued Saret 1: Reached 3,181 meters in sandstones of Cambrian. *Bordj Nili 3:* At 1,539 meters in Upper Jurassic.

A new oil well was announced by CREPS in its eastern division, some 25 miles southwest of Edéjlé in the Ordovician layers. The well, Ouan Taredert No. 1, was a test at 1,500 meters, yielding 6,000 liters per hour with bottom hole pressure at 161 kg per square centimeter. Drilling went 1,672.70 meters; 4½-in. casing was cemented at 1,540 meters for production from the oil bearing formation.

Discovery well, El-Gassi No. 1, located 80 kilometers south of M.D.1, (Hassi-Messaoud) reached the Ordovician sandstones and a production test gave 1,500 b/d under the same conditions as in Hassi-Messaoud field. Similarity is striking: depth, producing horizon, geological series, and oil flow are exactly the same in both fields. After crossing the pay of 80 meters (above 240 ft., drilling was continued in Hassi-El-Gassi No. 1.

Bordj Nili No. 2, drilled on the Western Berriane permit of S.N. REPAL, hit pay at 2,368 meters in Triassic sandstones where two tests gave commercial production, the second one eight cubic meters an hour with good bottom pressure. This formation could be the same as that at Hassi-R'Mel.

CREPS, the company that found the Edjélé and Zarzaitine fields, has announced it will slow exploratory work and concentrate on developing its oil discoveries via a pipeline which is planned for completion in 1960. There are 62 producing wells ready for operation in Edjélé with about 15,000 bbls/day capacity. It can be raised to about 30,000 bbls/day by Jan. 1, 1960. Zarzaitine productive capacity is estimated at 40,000 bbls/day from 26 producing wells. The field should produce about 100,000 bbls/day when installations are complete.

British East Africa: This territory, which includes Kenya, Uganda, Zanzibar, Tanganyika, Somaliland Protectorate, and Mafia, is seeing an increased amount of drilling. In Zanzibar, BP-Shell Petroleum Development Co. (Zanzibar) Ltd., is about to start a third well in Pemba. This year, it drilled to 2,500 ft at Tibirizi, abandoned the well, and drilled another between Chake and Chonga.

In Kenya, Lamba No. 2 well by BP was abandoned at 2,430 ft. Lamba No. 3 was abandoned at 2,500 ft. Now drilling is No. 4, about midway between Nos. 2 & 3.

In Tanganyika, BP-Shell Petroleum Development Co. of Tanganyika stopped drilling at Mandawa between Kilwa and Lindi at 13,336 ft. No oil was discovered. Exploration is continuing but only with seismic and geological surveys and shallow hole stratigraphic information drilling.

Somaliland Protectorate: The first traces of oil in Somaliland have been encountered in Standard-Vacuum's first wildcat in Africa. Shows above 3,450 ft in the No. 1 Dagah Shabel proved noncommercial, and the test, about 30 mi. south of Berbera, was drilled to a greater depth. No. 2 is at 4,688 ft (on Aug. 15) with no shows.

Ethiopia: No drilling is in progress. An exploration concession has been obtained by the German firm Gewerkschaft Elwerath owned by Esso, Shell, and Wintershall. Area covered is Ogaden province.

French Equatorial Africa (including Gabon, Middle Congo, Ubangi-Chari, Chad, French Cameroons): Drilling with two rigs in the Pointe-Noire and Nord-Kouilou areas going on in the Middle Congo by SPAEF. No discoveries are reported. In Gabon, the same company is using four rigs, of which two are exploring in the Nord-Ogoue section and two other heavy rigs are working in the Fernan Vaz section. In the Cameroons, one heavy rig is drilling on the Kwa-Kwa structure.

French West Africa (including Mauritania, Senegal, Sudan, Niger, Dahomey, Upper Volta, Ivory Coast, Guinea, and French Togoland). Soc. des Petroles du Senegal, in which the British Petroleum group holds a 50% interest, is drilling two test wells. One is Diourbel No. 1, in north-central Senegal and the other 30 miles to the east.

Libya: Contractors are pouring into Tripoli and hotel rooms are hard to get as the number of rigs active steadily increases. It will rise to 20 rigs by the end of this year as concessionaries strive to prove or disapprove their holdings before the compulsory surrender clauses come into effect in slightly over a year.

Oasis Oil is bringing in two rigs, making its total five. Two are to be used for wildcatting, the others for development of the discovery at Dahra. A wildcat is drilling now in Block 26 in the Fezzan, not far from the Tunisian and Algerian borders. Block 33 is to be drilled soon as well.

Esso may have proved a major field with its Zelton 2 stepout. It came in at 15,000 ft in mid-August and a stepout in the opposite direction, about 9 miles from the discovery well, is now underway.

Cie. des Petroles Total Libye is drilling with two rigs. Its fifth well is now drilling at Bir El Jaja No. 1 in Block 23. No results reported.

Shell is drilling via Anglo Saxon at Inazar No. 1 in Block 52 between the 28th and 29th parallels.

Mobil Oil of Canada is also bringing in a second rig. One is drilling now in Block 12, near Block 6 where Esso made its Zelten find.

Gulf Oil is bringing in a second rig from Sicily. A well is now drilling on Block 55 in Tripolitania.

Libyan America is drilling a test 14 kilometers west of the Oasis discovery at Bahi

(Continued on page 112)

Tanganyika. A Failing 2,500 test rig. BP is currently engaged in the search for new sources of oil in 6 far separated regions of the continent of Africa.

BP

New 128-Ft Lever-Lift Drilling Mast

Equipment engineers from oil companies and drilling contractors recently visited the Gateshead-upon-Tyne works of Armstrong Whitworth (Metal Industries) Ltd., where "Oilwell" Britain drilling machinery is made, and of Wright Anderson Ltd., fabricators of the new "Oilwell" Britain 128-ft lever-lift mast.

The occasion was of particular interest in that it was the trial rig-up of the first of 16 No. 66 drilling rigs being made in Britain for shipment to the YPF, Argentina, and because almost all the machinery is being made for the first time in England. Further, whilst the design is fully field proven, this was the first 128-ft mast to have been built and raised anywhere in the world, and this made the occasion of extra interest.

The machinery on view comprised an "Oilwell" No. 66 drawworks rated for 6,000 to 8,000-ft drilling; an "Oilwell"-Britain 550 triple drive equipped with three Cummins NHRS-6, 200 hp diesels with torque converters; and "Oilwell"-Britain 214-P, 350 hp, 7¼ in. by 14 in. slush pump driven from the tail of the compound; an "Oilwell"-Britain 200-W-150 hook block; and an independent mud-mixing unit with an "Oilwell"-Britain 8P-HD, 90 hp., 5 in. by 8 in. pump unitized on a skid with a Cummins HU-6 diesel. The rig was mounted on the new "Oilwell"-Britain 128 ft. 300,000 lb hook load (with 8 lines) lever-lift mast. The Cummins engines are also of British construction, coming from the new plant at Shotts, Lanarkshire. They are equipped with twin disc torque converters made under license by Rolls Royce Ltd.

Ground assembly consisted of the five main mast sections held together by the patented "wedge-lock" principle, and three crossbrace assemblies held in place by captive Tee bolts. Not a single loose nut or bolt is needed for the mast or substructure in rigging up.

The substructure, with a standard height of 9 ft, has many novel features. These include eccentric hinge-levelling for the mast; load-bearing floor assemblies fixed by wedge locks and captive Tee bolts: exceptionally clear working space below due to the use of knee braces with jack screws; skid-off windows; and an unusually roomy working floor with clear view of block up to the crown.

Crown block design is also of interest, being of crossover type which presents the slow line nearest to the derrickman (a safety feature) and slightly skewed to counteract natural twist in the rope, thus keeping the block straight. This arrangement also achieves equal load on all mast legs. Another novel feature is the snap-lock system of positively locking the raising legs in place, thus eliminating any risk of overtravel.

The actual raising and lowering operation was carried out by relatively inexperienced men in 5½ and 3 minutes respectively, without any check or the use of snubbing or pulling lines. In fact, a feature of this new mast is the claim that only the main hoisting machinery is needed and no snubbing lines are required. Further, that it is built to stand 100 mph wind load with a full pipe rack and without guy ropes.

The YPFA contract, secured in the face of keen international competition, called for the delivery of two rigs a month starting six months from order. The first complete equipment was shown prior to shipment 5½ months from order—which is the more creditable when it is realized that none of this equipment had been made before in the UK and that special pattern and tooling had to be made—and by end May two rigs had left for Argentina.

Armstrong Whitworth not only hold the license for UK manufacture of the range of equipment designed, developed and made in the US by the Oil Well Supply Division of the United States Steel Corp., but also for making the Reed range of tool joints; including the super shrink grip type. A tour of extensive Gatehead works made very clear the extent to which concentration on drilling and other oil equipment is now being expanded. Orders were seen in the course of manufacture for many major oil companies, including one of 120 off pumps for Venezuela on a "flow-line" basis, as is the case for the YPF drilling rig order.

Plant Russia Wants From UK

Details have been released in London of the long list of machinery and equipment for possible import from the UK in 1960-64 which Soviet officials gave to the British delegation during the recent trade talks in Moscow. These include equipment for factories (with annual capacities in tons) relating to oil or natural gas for producing: helium from natural gas; copolymers of styrene (5,000); activated black from liquid raw materials; fat synthetic alcohols (5,000); styrene and shock-resistant polystyrene (20,000); tetrafluorethylene (3,000); synthetic glycerine (20,000); and ethylene urea (1,000).

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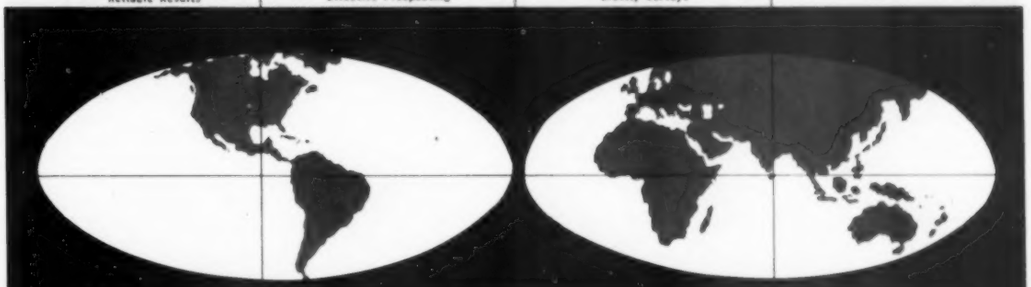

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Petrochemical Raw Materials for Nylon Resins

(Continued from page 59)

one illustration, 20 lb of molten cyclohexanone oxime and 32 lb of 97.8% sulfuric acid were introduced at separate points of the reactor liquid. Reaction temperature was held between 17 C and 141 C. Reaction product was continuously withdrawn from the system, and the caprolactam-containing solution was cooled below 75 C to avoid hydrolysis. Yield of crude caprolactam was 94.5% of theory, based on the oxime.

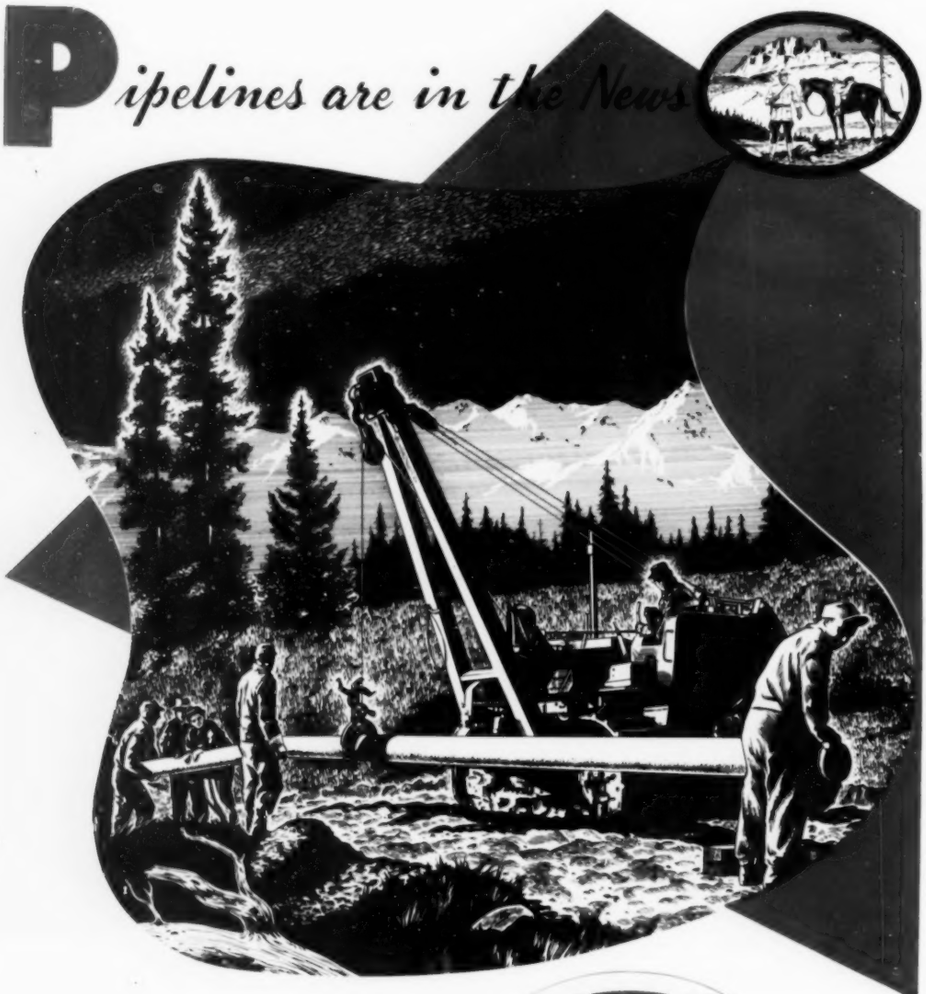
Before the reactor can be worked up, it must be neutralized (e.g., with ammonia to yield salable byproduct ammonium sulfate). Following this step, and subsequent separation of the aqueous salt solution, a wet oil is obtained with a lactam content of about 70% by weight. From this, the lactam can be recovered by vacuum distillation or by solvent extraction, (e.g., by means of benzene). However, product obtained in this manner contains small amounts of objectionable contaminants. According to Stamicarbon[19], this difficulty is avoided if the crude lactam oil is first concentrated to 80% by evaporation at pH between 5 and 8.

The concentrate is extracted with benzene to yield a 20% to 25% by weight of concentration of lactam in the solvent. Caprolactam is recovered from the extract by distillation.

An interesting alternative method for rearrangement of cyclohexanone oxime has recently been announced by Badische Anilin and Soda-Fabrik. Here the rearrangement is catalyzed by HCl to form cyclohexanone oxime hydrochloride as first intermediate. According to BASF, this approach simplifies temperature control, eliminates need for neutralizing, and for separating and drying the oxime.

BIBLIOGRAPHY (Part II)

4. Lindsay, A. F., Special Supplement to *Chem. Eng. Sci.* vol. 3, 1054, pp. 78 ff.
5. Muskat & Northrup. *J. Am. Chem. Soc. 52*, 4046 ff. (1930).
6. Farlow, M. W., US Patent 2,518,608 to DuPont, Aug. 15, 1950.
7. Howk, B. W., US Patent 2,532,311 to DuPont, Dec. 5, 1950.
8. Romilly, L. E., US Patent 2,532,312 to Dupont, Dec. 5, 1950.
9. US Patent 284,525.
10. US Patent 2,504,024.
11. Lazier, W. A., and Rigby, E. W., US Patent 2,181,140 to DuPont (1939).
12. Grundmann, C., and Haddenwanger, H., *Angew. Chemie* 1950, p. 557.
13. US Patent 2,634,269.
14. German Patent 810,402.
15. Taylor, A. W. C., and Reynolds, P. W., US Patent 2,636,902 to Imperial Chemical Industries (April 28, 1953).
16. German Patent Application DAS 1,002,333. Badische Anilin & SodaFabrik, Feb. 14, 1957.
17. Winans, C. F., *Ind. Eng. Chem.* 1941, pp. 931 ff.
18. US Patent 2,487,246.
19. British Patent 736,196.



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Analog Simulator For BP

An analog simulator is being built by Air Trainers Link Ltd. to the specifications of British Petroleum Co.'s engineers for the use of the refineries and technical department. It will be installed in one of the London offices for use in such problems as refining plant operational economics, stress and vibration analysis, and the best methods of training plant operators in automatically-controlled processes.

UK-USA Equipment Links

Following the successful association over many years between the iron and steel division of Arthur G. McKee & Co., of Cleveland, Ohio, and the British refinery engineering firm of Head Wrightson & Co., Ltd., of Stockton-on-Tees, it is announced that talks are proceeding between McKee's oil division and Head Wrightson's oil engineering interests with a view to closer cooperation in this field. This does not, however, include the latter's nuclear power division or the company's interest in nuclear research reactors, which are excluded.

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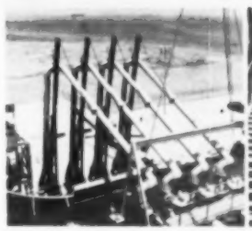

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OIL COMPANY STAFF CHANGES

T. G. Kelliher

H. H. Neel

Dr. Eraso

Dr. Chacin

HENRY H. NEEL, former Tidewater exploration manager, has been appointed manager of foreign exploration and production for Tidewater Oil Company. **T. G. KELLIHER** has been named manager of exploration, replacing Mr. Neel.

DONAD B. LAMONT has been elected vice president and director of San Jose Petroleum, Inc., a company whose subsidiary, San Jose Oil Co., Inc., owns oil concessions in the Philippines.

R. B. PHILLIPS has been appointed as director, plans and programming and **J. D. MARQUIS** as director, accounting and statistics in the marketing department, Gulf Oil Corp. Mr. Phillips will assist the departmental coordinator of world-wide marketing objectives, plans and their programming for Gulf.

A. P. ENDRES has been appointed manager of public relations services for General Petroleum Corp. He succeeds W. B. Curtis, who has retired. A veteran of 20 years with General Petroleum, Mr. Endres joined the company in 1939 as a division sales clerk. In 1946, when the General Petroleum public relations department was formed, he was appointed assistant to the manager.

J. H. DAVIS has been promoted to assistant manager of Continental Oil Co.'s headquarters geological section.

KELLY H. GIBSON has been named executive vice president and a director of Pacific Petroleums Ltd. Mr. Gibson who has been actively connected with the oil industry for 25 years was previously vice president in charge of production for Pacific.

J. R. HUNT has been elected a director of Empire Geophysical, Inc. He is Empire vice president and regional manager in Denver.

William Cleveland

WILLIAM CLEVELAND, a director of Creole Petroleum Corp., has returned to the United States after 21 years in Venezuela with the company. He will now occupy a post with Standard Vacuum Oil, also as a director.

DR. GUILLERMO RODRIGUEZ ERASO, assistant manager of Creole's Department of Petroleum Economy in Venezuela, has recently been appointed economic adviser to Creole's president, Arthur Proudfit. Dr. Rodriguez is replaced by J. H. Pantin, formerly supervisor of the geological department.

CLIFTON C. GARVIN, JR., has been appointed assistant general manager of the supply department by Esso Standard Oil Company. Mr. Garvin, who joined the company in 1947, has been serving as operating superintendent of the Baton Rouge Refinery.

H. R. WALL has been elected president and chief executive officer of Continental Carbon Co. He succeeds Robert I. Wishnick, now chairman of Continental Carbon. Mr. Wishnick has been serving as president of Continental Carbon since its inception in 1936.

HAROLD SVOBODA, manager of production, has been elected vice-president of Sunset International Petroleum Corp. Mr. Svoboda joined the company as a petroleum engineer seven years ago.

E. T. LINCOLN has become the new vice president and assistant manager of the Sinclair Venezuelan Oil Co. replacing J. J. Quoyeser who has been transferred to Bogota as president of the Sinclair Colombian Oil Co. Max R. Guevara, Sinclair's former purchasing agent has been promoted to executive assistant to take Lincoln's place.

G. C. K. DUNSTERVILLE has retired as president of Shell of Venezuela on June 30 to be succeeded by John Arthur Warder, a former vice-president of the company. G. A. Warder will move into the vice-presidents' position formerly held by Warder. Mr. Dunsterville joined the Shell group in 1925. serving first in Bakersfield, California. Since then he has worked with the company in Egypt, Romania, Colombia and The Hague. He worked in Venezuela for the last 11 years. He plans to remain in Venezuela after retirement.

EVERETT F. STRATTON, formerly vice president-operations of Schlumberger Well Surveying Corp., has been elevated to executive vice president, and Charles K. Ruddick, formerly southeast area manager at New Orleans, replaces Mr. Stratton as vice president-operations.

JAMES C. CONNER has been named to a newly established position as administrative assistant to chairman Frank O. Prior of Standard Oil Co. (Ind.). Mr. Connor will assist the chairman in handling industry activities in the field of natural gas, including the problem of governmental regulation and control of all energy resources under proposed end-use control plans. He was formerly division gas superintendent of Pan American Petroleum Corp., an affiliate, at Forth Worth, Texas.

PETER R. McARTHUR has joined The Ralph M. Parsons Co., Los Angeles. He will be responsible for business development in the petroleum, chemical, and petrochemical industries.

NORMAN ALPERT, Earl Vincent Clark and Newbold O. Cross have joined the staff of the Esso Research and Engineering Co. Dr. Alpert had been with Texaco, Inc., as a group leader in fuels research. Mr. Clark was with Dewey & Almy Chemical Co. and Mr. Cross was with Esso Standard Oil Co.

JOHN H. CHILDS has been appointed general manager of advertising and sales promotion for Texaco Inc. A Vice President of Cunningham & Walsh Inc. and Account Supervisor on the Texaco account, Mr. Childs joined that advertising agency in 1954. Previously he served in the merchandising department of a large industrial concern.

DR. FRANCISCO ALVAREZ CHACIN has been appointed assistant manager of Public Relations of Standard Oil of N. J.'s Venezuelan affiliate, Creole Petroleum Corp. Dr. Alvarez has had a long experience in the field of public relations, both with the government and with Creole, which he entered in 1949.

ROBERT K. DIX has been elected a vice president by the Enjay Co. Inc. to succeed H. J. Rose, who resigned recently to become a vice president of Esso Export Corp. Mr. Dix was formerly assistant general manager of Esso Standard's Baton Rouge, Louisiana refinery.

JOSEPH T. FROEHLICH and **ROY L. LAY** have been appointed general managers of the foreign operations dept. (eastern hemisphere) of Texaco Inc. Mr. Froehlich has been Superintendent of Texaco's refinery at Anacortes, Wash., since February, 1957. Mr. Lay has been assistant to the vice president in charge of foreign operations (eastern hemisphere).

J. T. HIGGINS has been elected vice president, director and general manager of manufacturing for Standard Oil Co. of California, Western Operations, Inc. He succeeds Fred Powell, who was recently named president of California Chemical Co. Mr. Higgins will coordinate Standard's manufacturing activities at refineries in Richmond, El Segundo and Bakersfield, California, and at the new refinery presently under construction near Honolulu, Hawaii.

RAYMOND M. CAMP has been named superintendent of crude, cracking and coking operations at Tidewater Oil Co.'s Delaware Refinery, and Eugene Andrechak was appointed superintendent of economic planning and accounting.

W. B. GOLUSH, formerly manager of the head office gas department, has been named general gas manager of Shell Oil Co. He will have over-all responsibility for coordination of the company's natural gas-gasoline activities, including relationships with the Federal Power Commission on natural gas matters. J. T. Jordan, formerly manager of the head office technological department, has been named manager-gas engineering in the gas department and M. L. Newmaster, formerly superintendent of Shell's TXL gasoline plant in West Texas, will serve as senior gas engineer in a gas utilization group.

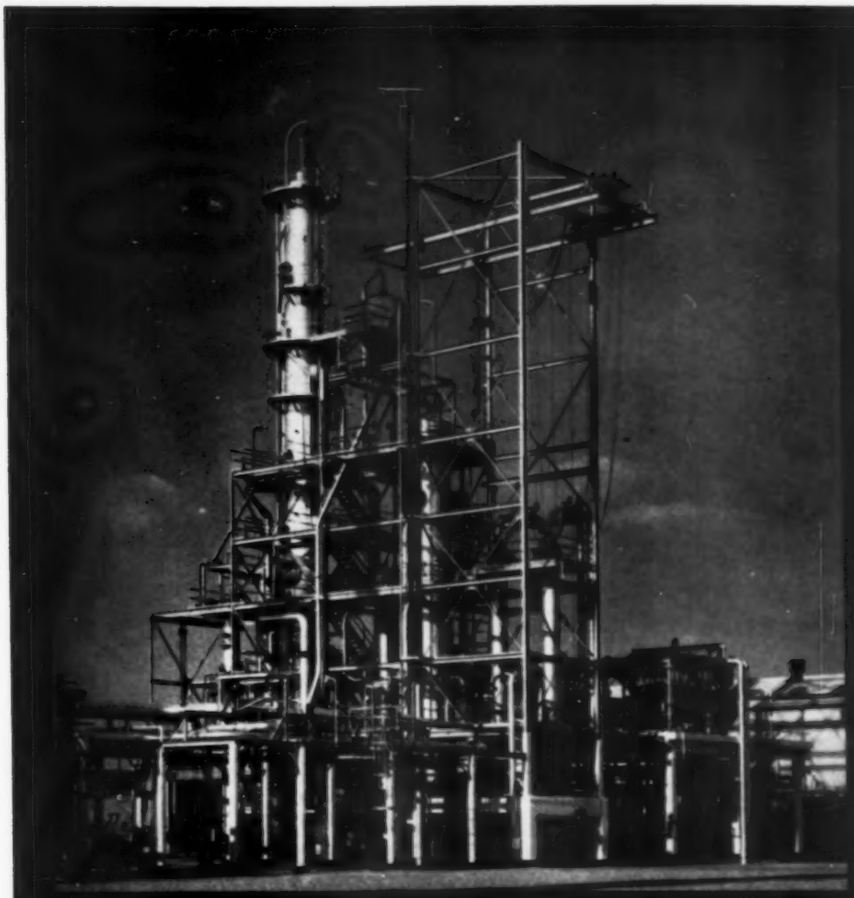
O. L. ODALE, production manager for Shell Oil at Denver has been named production manager for the Pacific Coast area. J. W. Inkster, exploration manager in Tulsa, will move to Houston in the same capacity. R. L. Trott, executive assistant to the vice president, Tulsa area, will assume a similar position in the Houston area.

HAROLD P. CREEL has been appointed superintendent of Texaco Inc.'s refinery at Anacortes, Washington. He formerly was assistant superintendent for maintenance and construction at Lockport, Illinois. He succeeds Joseph T. Froelich, who has been transferred to New York as a general manager in the company's foreign operations dept. (eastern hemisphere).

From 1954 to 1958, Mr. Creel was with the Iranian Oil and Refining Co. in Abadan, Iran, first as a member of a survey party and later as head of operations. He was named Assistant Superintendent of Lockport Works in December, 1958.

Tidewater Appointments

Four supervisors have been named to new posts at Tidewater Oil Co.'s Delaware refinery. Ray Harrison, Jr., was named to assist the manufacturing manager in petrochemical development; Lloyd C. Forbes was appointed superintendent of utilities, oil dispatching and sulfur recovery; Charles H. Bennett was named staff assistant to the manager, and Erich R. Westfield was appointed supervisor of economic planning.



The photographs show the Hydrodesulphurisation Unit at Shell's Stanlow Refinery and are by courtesy of the Shell Petroleum Co. Ltd.

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INTERNATIONAL NEWS AND NOTES

Platformer For Kuwait

The new 4,000 b/d Hydrobon Platformer (licensed by Universal Oil Products Co.) which went on stream early June at Kuwait Oil Co.'s 190,000 b/d Mina al Ahmadi refinery will make the importation of high octane spirit for blending with the locally-produced gasoline unnecessary in the future. An early result of this commissioning was the drop of premium grade motor fuel price at the company's sales filling station by about three farthings a gallon to 1s, $1^{3}/_{4}$ d., to which a local tax of about a halfpenny is added.

Kuwait Loading Record

A new loading record was made at the Mina-al-Ahmadi terminal of Kuwait Oil Co. in June when the "Universe Admiral" took on 83,874 tons of "commingled crude, diesel and distillate" in 12 hours 50 minutes, or a rate of 6,536 tons (50,000 bbls) an hour. The previous record was 6,468 tons an hour, made when loading the "Universe Commander" in August 1958. Another new record was made recently—the largest tanker to load at the terminal. This is now the 60,600 dwt "Torrey Canyon," 810 ft. in length.

Kuwait North Pier Commissioned

Commissioning of the North Pier at the Mina al Ahmadi terminal towards the end of June, the second of Kuwait Oil Co.'s piers, represents the fruit of 18 months' efforts on the part of the contractors, Kuwait Bechtel Corp. and George Wimpey & Co. Ltd. Three tankers may be berthed at present but the number can be increased when required, and the largest vessels can be handled at all times.

This all-welded structure, 2,304 feet long and 126 ft. 2 in. wide is reached from the shore via a 4,700-ft. long approach rising from 16 to 20 ft. above low-water level. Special features include Baker patent fenders and two different types of loading devices. These are two batteries of British-made electro-pneumatic hose handling units made by the Sheepbridge Co., and a hydraulically-operated unit made in the US by the Chicksan Co. Either type gives a potential 7,200 tons/hour loading rate on one jetty line, or up to 10,000 tons on two lines. Foam monitors mounted on deck and on 24 monitor towers provide a fire-fighting capacity claimed to be unequalled on any comparable Middle East installation.

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Naphtachimie To Produce Butadiene

Naphtachimie SA, in which Soc. Francaise des Petroles BP has a substantial interest, is to build a plant to produce butadiene based on cracked gas from the adjacent Lavera refinery near Marseilles. Initial output will be 6,000 to 7,000 tons a year.

Sinclair Buys Eastland

Sinclair Oil & Gas Co. has purchased all assets of one of Texas' pioneer independent oil companies, The Eastland Oil Co. of Fort Worth. Eastland assets include producing properties on 67 leases in 16 counties in West Texas and in one county in New Mexico. The leases total approximately 5,600 net acres on which are located some 150 net producing oil and gas wells. Current daily net production is 1,600 barrels of oil and 3,000,000 cubic ft. of natural gas. Also involved in the sale are 500 net acres of undeveloped leases in West Texas and 4,400 net acres in Mississippi.

Japan's Offer To Indonesia

Indonesia's state-owned, army-controlled Permina Oil Co. directors have agreed in principle to accept a Japanese offer to rehabilitate and develop oilwells in North Sumatra on credit terms, according to Col. Dr. Ibnu Sutowo, president and director of Permina.

Japanese companies will invest $50 million over a 10-year period in credits and technological know how, and 50% of the oil produced by Japanese efforts will be sold back to Japan at a nominal price based on the cost of Indonesia's contribution to the output, with the remainder of the price marked off against Japanese loans.

The loan would be repaid over a 30-year period by Indonesia. Japanese experts will attend board meetings of the Indonesian state petroleum company as observers. Japan plans to create a $13.9 million investment firm to despatch engineers and technical men to Sumatra.

Australian Hunt Speeded

An airborne magnetometer survey has been begun on 30,000 square miles of petroleum concessions held by Magellan Petroleum Corp. owned by the Buckley group, in south-central Queensland (Australia' from bases at Charleville and Longreach in north-central Queensland. Magellan has also begun gravity meter studies of another concession of 3,200,000 acres near Winton, which is also in Queensland.

Big Japanese Petrochemical Plant

Test operation of Nippon Petro-Chemical Co.'s facilities in Kawaski City, Kanagawa Perfecture, have set in motion Japan's largest petrochemical plant. The Japanese firm is receiving naphtha from the Yokohama refinery of the Nippon Oil Refinery and will produce ethylene, propylene, butadiene, by-product gases, and benzine. All these products, excepting only benzine, will be supplied to Showa Petro-Chemical, Furukawa Chemical, Nippon Catalyst, Nippon Zeon, Asahi-Dow, Showa Denko, Nippon Soda, and Asahi Denka.

Two other firms are also enaged in petrochemical production. These are the Mitsui Petro-Chemical, with its plant in Iwakuni and the Mitsubishi Petro-Chemical, with its plant at Yokkaichi.

Australia Limits Gasoline Stations

Major oil companies marketing in Australia have agreed on a nation-wide plan for rationalizing the construction of new service stations. The plan limits the number of new service stations which might be constructed in Australia to 270 a year for three years beginning September 1, 1959. Adoption will reduce building to about 20% of the average number of service stations constructed over the past three years.

Australia Subsidizes Drilling

Companies drilling for oil in three states will share in Australian Government subsidies of more than $500,000. The companies sharing in the $500,000 subsidies are Delhi Australian Petroleum Ltd., drilling at Betoota, Queensland, Exoil Pty Ltd., drilling at East Gambanga, W. A., and Madura, Eccla Plain, W. A., and Australian Paper Manufacturers Ltd., at Rosedale, Victoria.

Exploration In Senegal

Soc. des Petroles du Senegal, in which the British Petroleum group holds a 50% interest, is drilling two test wells. One is Diourbel No. 1, in north-central Senegal and the other 30 miles to the east. A BP seismic part is at work in another part of the country.

Union Oil Venture In Japan

The Maruzen Oil Co. will join forces with the Union Oil Co. in setting up a joint $10 million oil concern. This firm, to be named Unima, will be invested in by the two companies on a 50-50 ratio. Starting capital will be $2 million, $1 million from Maruzen, $1 million from Union Oil. The president will be Kanji Wada, president of Maruzen, and the board of directors will include five directors from each enterprise.

The new concern will have three principal aims: development of oil, primarily in the Celebes, construction of oil refineries in Thailand and Malaya, and sales of oil products throughout Southeast Asia, Australia and New Zealand.

New Australian Chemical Company

Paccal has formed a company to make petrochemicals. Australian Petrochemicals Ltd. has been registered in Melbourne, with Petroleum & Chemical Corp. (Aust.) Ltd. and Monsanto Chemical Co. of St. Louis, Mo., U. S. A., sponsoring the new company. It will make styrene monomer, a liquid used to make polystyrene plastic, now imported.

Australian Petrochemicals has begun the plant at Silverwater, Sydney, alongside the present Paccal plant. It will be in operation by 1961, and will cost about $5 million. Directors of Paccal are also proceeding to erect a Udex plant for the manufacture of pure benzene, toluene and xylene.

LPGas Plant In Arabia

The Arabian American Oil Co. announced it is constructing a $5,250,000 plant to make LPG available for offshore sales from its Ras Tanura terminal on the Persian Gulf coast of Saudi Arabia. The new plant is scheduled for completion in August, 1960.

Brazil Oil Payments Slowed

The Petroleum Council has asked companies supplying crude petroleum and refined products to extend the period for payment from 180 days to 12 or 18 months owing to temporary exchange difficulties. The value of imports in 1958 amounted to approximately U. S. $240 million.

Belgian Chemical Plant For Japan

Soc. Belge de l'Azote et des Produits Chimiques du Marly (SBA), of Leige (Belgium), has concluded an agreement with the Japanese SUMITOMO Chemical Co. Ltd. for the design and construction of a large plant at Niihama City for producing acetylene and ethylene from liquid hydrocarbons.

Iran Refinery

A Greek firm, Elbyn Lubricating Oil Refinery Ltd., has been awarded a bid for construction of a small refinery in Iran.

George Syrenghelas, owner of the Greek firm, said the plan is to supply, build, and operate a $2 million refinery with annual output of 10,000 metric tons of lubricating oils and waxes. The plant will

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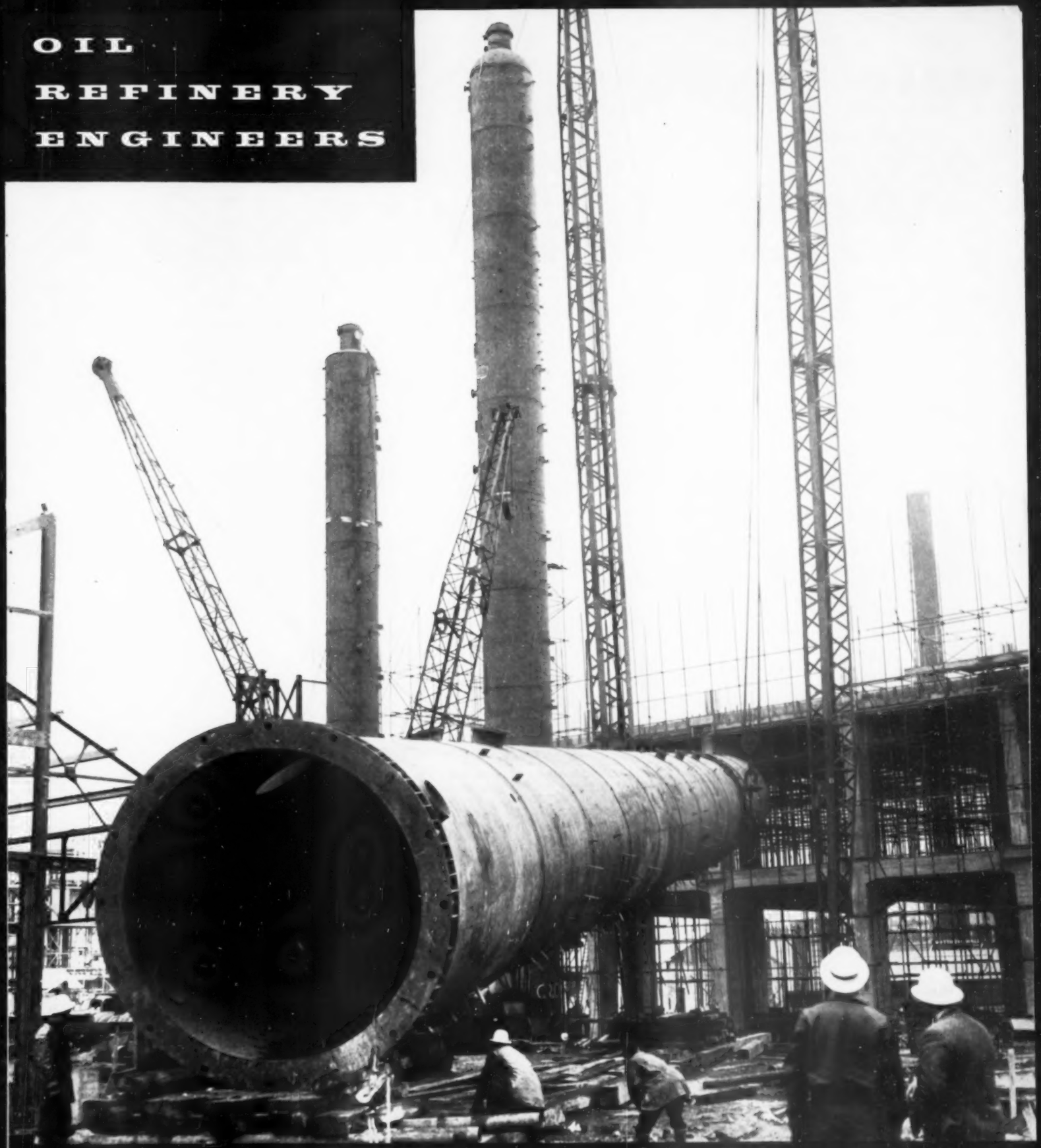

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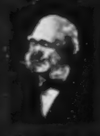

use reduced crude from the Abadan refinery. It will employ 150 persons. The Greek government has promised financial aid to Elbyn for the project.

Soviets Supply Greece

Soviet nations supplied 394,942 metric tons of petroleum products to Greece last year, some 22.6% of Greece's total imports. This compared with 273,-329 tons or 16.7% in 1957 and 223,389 tons, or 14.5% in 1956. The 1958 products came from Russia, 294,-728 tons; Romania, 91,209 tons; and Bulgaria, 9,005 tons.

The USA share of the business dropped from 63,-259 tons, or 3.9% in 1957 to 58,001 tons or 3.3% in 1958.

Total imports of petroleum products by Greece last year came to 1,748,309 tons compared with 1,631,681 in 1957 and 1,545,013 tons in 1958. The average per ton cost was $29.80 in 1956, $35.47 in 1957, and $30.22 in 1958.

Swedish Refinery Purchase

Swedish Shell Oil Co. has obtained the right to purchase a half interest in Koppartrans Oil Refinery at Goteborg, with an annual capacity of about 2,000,-000 cubic meters of petroleum products.

100 Million Tons Through Banias

Banias, Syrian terminal of Iraq Petroleum's 30-inch pipeline from Kirkuk (completed in April, 1952) exported its 100 millionth ton in May—between 755 and 760 million barrels. Since last year over 5,000 tankers had loaded crude by mid-June.

Buys Drilling Company Interest

Commonwealth Petroleum Limited has acquired a financial interest in General Petroleum Drilling Co. Ltd. thus obtaining a financial interest in an additional twenty drilling rigs owned by General Petroleum. Prior to the transaction, Commonwealth had 28 drilling rigs.

USSR Barters Oil Equipment

The USSR has offered to exchange oil exploration equipment for Brazilian coffee, according to Brazilian financial circles. The offer would trade for $120 million of coffee.

Phillips To Build So. Africa Plant

An oil carbon black plant will be built in the Union of South Africa by Phillips Petroleum Co. and Industrial Development Corp. of South Africa, Ltd. The two companies are forming an equally owned company, which will be known as Phillips Carbon Black Co. (Proprietary) Ltd., to build and operate the 22 million lb/yr plant.

Colombian Discovery

Cities Service Co. has announced a new producing oil well, with an indicated daily potential of 800 barrels of 35 gravity oil, on the Las Monas structure of the two million-acre El Carare area in Colombia.

The well is producing from 99 feet of perforations at depths ranging from 4700 feet to 6372 feet. This is the third producing well drilled on the Las Monas structure by a subsidiary, Colombia-Cities Service Petroleum Corp. An active drilling program is being carried forward to determine the extent of the field. The Colombia project is a joint venture which includes Colombia-Cities Service as operator, Richfield Corp. and Empresa Colombiana de Petroleos.

Dry Australian Well

Humber Barrier Reef Oil Pty. Ltd. has struck what is believed to be basement at 1,795 feet in its exploratory well on Wreck Island, Great Barrier Reef, off Queensland. The company intends to carry out further geographical study of the Barrier Reef with the object of selecting another suitable site for drilling.

Papuan Offer

Associated Australian Oilfields, Associated Freney Oilfields, and Papuan Apinaipi Petroleum are hoping to affiliate with U. S. interests. B. R. Randell, chairman of Associated Australian Oilfields, said the group would like to come to an arrangement with a U. S. company as Santos Ltd. had done.

Timor Wildcat

Tradewinds Exploration Inc. will begin drilling at Timor, Australia in mid-July. The well will be at South Ossulari, 25 miles southwest of Aliambatu, 2½ miles from the coast.

Tradewinds will drill a total of 15,000 feet to qualify as a partner in Timor Oil Pty. Ltd. This will involve two or more wells. Tradewinds first well will go to a maximum of 7,500 feet.

Oil Shale In Spain

A total of 192,236 tons of bituminous shale was treated in Spain in the first quarter of this year, it is reported by Empresa Nacional Calvo Sotelo. Crude oil production was 15,898 tons and gasoline output was 1,028 tons and ammonium sulphate output was 1,291 tons.

Crude oil runs to stills in the first quarter as reported by Refineria de Petroleos de Escombreras, S. A., came to 976,648 metric tons, plus unfinished oil rerun of 24,607 tons, for a total of 1,001,255 tons. Product output was 958,302 tons and refinery loss was 42,953. Crude runs to stills on the Canary Islands, as reported by Compania Espanola de Petroleos, S. A., came to 710,306 tons, and unfinished oil rerun to 54,086, or a total of 764,392. Product output was 758,556 tons and refinery loss was 5,836.

New Trans-Europe Pipeline

Before the end of this year, a new company, Piseur in France is expected to invite bids to construct a 465-mile crude pipeline from Lavera, France, to Strasbourg in France and Karlsruhe in Germany. Piseur, of which the president is C. A. Lambert, has set up a time table for the construction of the line, including ordering the pipe and signing of contracts in the first half of next year and start of operation of the line Jan. 1, 1963.

The company was founded by 19 French, German, Dutch, Belgian, British and American companies, with the American firms including California Texas, Mobil Oil and Esso Standard. The 19 include most of the large petroleum groups which today supply Western Europe.

Laying of the line is to start in the first half of 1961 and the erection of pump stations and of storage facilities in the second half. Cost is estimated at 60 billion francs, or about $120 million U. S. Starting capacity will be 10 to 12 million tons of crude oil a year (200,000 to 240,000 bbls/day) with two pump stations and the capacity maybe doubled by 1975 by spending an extra 10 to 15 billion francs.

Construction of four refineries, two near Strasbourg and two near Karlsruhe are planned to use the crude oil from the new line. The Shell-Caltex has begun preliminary work toward a refinery near Strasbourg, which will have a capacity of 3,500,000 tons in 1963 and 6,000,000 tons in 1965. A French consortium will build a plant a little to the north of this one with starting capacity of 3,000,000 tons and capacity of 6,000,000 tons by 1970.

Certain American and French interests had held out for a line to carry refined products, but they were overruled. Coal and shipping interests have expressed disapproval of the planned project.

The French hope that 75% of the crude for the line will come from the Sahara, with the rest from the Middle East, much of it from Iraq. Other pipelines are in the planning stage for Europe. The Germans are considering one from the North Sea to the South to supply Western Germany. An Italo-Swiss project to start at Genoa and to reach to Munich in Southern Germany, is under study.

New Sahara Concessions

The French Government has announced the grant of ten new oil and gas prospecting concessions in the Sahara—the first since those announced Aug. 30, 1958.

The new concessions cover 26,860 square kilometers, about 10,370 square miles, and call for a minimum investment of 6570 million francs, the equivalent of $13.4 million U. S. The leases run for three to five years.

Largest concession, 20,600 square kilometers, was to a consortium of three companies in which Standard Oil Co. (N. J.) has 50% interest. This is the first and only concession in the Sahara in which an American company has been granted as much as a 50% interest.

Others in the deal are Compagnie Francaise des Petroles (Algerie), 35% owner, and Societe de Participations Petrolieres-Petropar, 15% owner. Concession runs for five years with minimum investment of 5,000 million francs.

Other American companies participating in new concessions are Sinclair Petroleum Co. 27% owner and Newmont Mining Co. 18% owner of a 230 square kilometer concession until Sept. 28, 1963, with minimum investment of 80 million francs. Phillips Petroleum Co. of France, 25% owner of a concession of 600 square kilometers of five years, with minimum investment of 170 million francs; British Petroleum Co. 44% owner of each of three concessions of 100,200 and 1,500 square kilometers, with minimum investments of 25 million francs, 50 million and 500 million francs respectively.

Venezuela's Production Up

Crude oil production in Venezuela in the first five months of this year was 2,858,800 b/d, some 351,400 b/d ahead of the totals for the same period of last year. Some Venezuelan officials point to these figures as evidence that the U. S. mandatory oil import program has not yet caused hardships in Venezuela.

Creole increased its production from 1,018,600 b/d. to 1,165,500 b/d. in the first five months of 1959 over 1958, and Shell stepped up its production from 686,-900 b/d. to 884,400 b/d. Newcomers, Superior, Sun, San Jacinto and Signal have increased their production from 16,200 b/d. in 1958 to 100,700 b/d. in 1959. All other producers were down this year versus last, except Caracas with 100 b/d. this year.

Kenya Refinery Survey

Shell Oil Co. has a team of technicians making a survey of potentialities of a new oil refinery at Mombasa in Kenya. A five-year agreement, freezing 2,200 acres at Mombasa as a possible site for the refinery is to lapse in March, but may be extended.

Murphy Corp In Papua Underwater Oil Search

An oil search, the first of its kind in the southwest Pacific, in the Gulf of Papua, will be done by a recently-formed Australian company, Camelot Nominees Pty. Ltd. Camelot, which recently obtained a lease to survey a large area of the Gulf sea bed, is backed by an American company, Murphy Corp., of Arkansas, last year had assets totalling about 74 million dollars. A company in the Murphy group will carry out the search on behalf of Camelot.

Camelot's permit is for an initial 12 months period covering general reconnaissance of the search area. The Puri area where oil was found last year is only 59 miles north of the offshore area covered in the permit.

Soviet Pipeline To Satellites

The Soviet Union and 4 of its satellites (Poland, East Germany, Czechoslovakia and Hungary) will build a 2,400-mile-long oil pipeline. It will begin in the Ural-Volga region and divide in Byelorussia into two. One branch will go to Vloclavek (Poland), where a refinery is to be built, and continue to Schwedt (East Germany), where another refinery is to be built. The other branch will lead to Bratislava (Czechoslovakia, where the "Slovnaft" refinery is under construction. In Slovakia, another branch will go to Budapest, where a 20,000 b/d refinery is to be built. The latter plant will probably be located at Szazhalombatta, 16 mi. south of Budapest.

The pipeline, construction of which is to start next year, is to cover the import requirements of crude oil, which in 1965 will amount to 15 mill. tons (300,000 b/d) for all four satellites combined. The Soviet Union will assist in the designing and construction of the pipeline.

First Soviet Rigs In Egypt

The first consignment of Soviet drilling rigs for depths of 9,843 ft to 16,405 ft arrived in Egypt recently. These deliveries are being carried out under the terms of the credit agreement signed in 1958.

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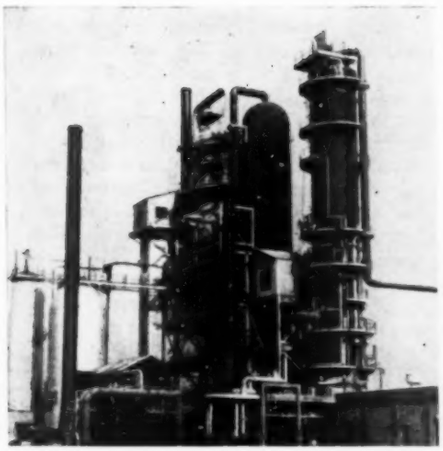

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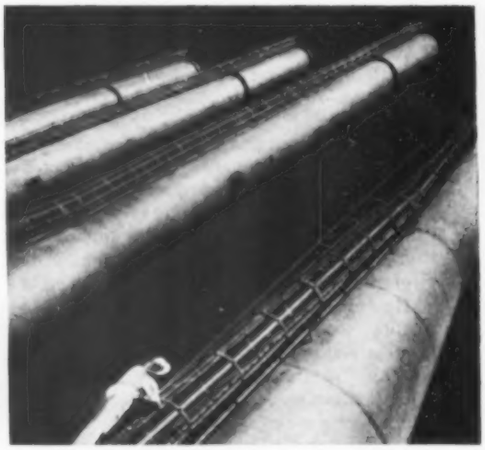

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(Continued from page 100)

(the find by Ohio before Dahra). Two other tests are to be drilled in this block. Some may be drilled in Block 20 next year, which is about 50 kilometers from the Zelten find by Esso.

Texas Overseas Petroleum—California Asiatic, of the Caltex Group, is drilling a wildcat and has just brought in another rig.

Resan 1 is logging at 6,767 ft as of August 13. Location is 83 miles southwest of the town of Sebha in the Fezzan. Beda 1, 130 miles south of the town of El Aghaila (on the Sirte Embayment) is running 9⅝ in. casing at 4,497 ft.

The deepest test well yet to be drilled in Libya for BP Exploration Co. is to be spudded-in in mid-October. It will be the first well to be drilled in BP's concession area in Cyrenaica, the site being some 200 miles south of Tobruk and the same distance from the Egyptian frontier.

Madagascar: SPM is drilling an exploration well near Folakara in the northern part of its concession area.

Morocco: First oil shows on disputed Morocco-Algerian frontier have been found at M'Hammid Oasis in two wells drilled for water by Bureau de Recherches et de Participations Minieres (50-50 Moroccan and French governments). The matter already has applied for rights on 200 square miles in the area, drilling is continuing.

Ambassador Oil Co. of Texas has been granted an exploration license covering Hamada du Dra, Kem-Kem and Hamada du Guir, southeast of the Atlas Mountains, in areas claimed by Morocco in the Sahara.

Another American company, the United States Exploration Co., has reportedly applied for an exploration permit over 20,000 sq. miles in the Larache region of North-West Morocco.

Nigeria: Shell has 8 drilling rigs active, three drilling exploratory wells. A number of shows have been obtained, including one at Korokoro, 25 miles south of Aba Town, and "traces" at Anua in the Uyo division. The Ubulu well in Benin province was abandoned dry, as was the Ethiopia well. The Korokoro rig has been moved to Bonney Island. The Uyo rig is drilling new at Ubium in Eket division. Shell is moving in an offshore platform to drill off coastal waters.

Mobil International has a concession but no drilling is in progress.

Somalia: Standard Vacuum is not drilling yet. Sinclair and AGIP have active campaigns underway, each drilling with one rig.

Spanish Sahara: No drilling is underway as yet in the Spanish Sahara, however, a number of companies are actively interested and will enter as soon as bids have been settled in Spain.

Tunisia: Serept, (Ste. de Recherches et d'Exploitation des Petroleum en Tunisie) is drilling at Bir el Adam near Mechiguig, and reached 3,720 meters in April. Serept went to 2,218 meters in the Oued Siah area, and moved the rig to Djebel Melab where drilling began in March. Serept stopped drilling at the Sebhkra oum El Kraalate after going to 1,557 meters, and has the rig idle. Serept is the only one of three with oil concessions in Tunisia which has reached the drilling stage.

Asia And Australia

Proving what a stable political climate and workable legislation can do, Australia is attracting more attention than any other country in this area. A new source of crude supply would be most welcome in this energy-short sector of the world. Realization of that fact led to the recent conference at New Delhi on petroleum but the results on the conference in concrete form are not visible yet.

Australia: Interest in Australian oil possibilities has revived and a number of wells are drilling. In the west, Western Australian Pty. Ltd. (WAPET) has ceased drilling temporarily (as of August 15) and is looking for new locations.

In south Australia, Delhi Australian Petroleum Ltd. (associated with Santos Ltd. and Frome-Broken Hill Co., Pty. Ltd.) has drilled a disappointing dry deep well on the Innamanicka structure four miles from the Queensland border. Delhi is now surveying in the region and choosing another location. in Victoria, Frome-Broken Hill Co. Pty. Ltd. is selecting a site for deep stratigraphic hole in the southwestern part of the state. Two companies will carry on geological surveys for selection of sites for stratigraphic hole in the southwestern part of the state. Two companies will carry on geological surveys for selection of sites for stratigraphic test wells.

In New South Wales, Australian Oil and Gas Corp., Ltd., is drilling a number of holes in the Camden area and a deeper hole at Mulgoa, south of Penrith. Gas flows to 70,000 cubic feet a day have been struck in several horizons. The company plans stratigraphic bores near Morisset, 30 miles south of Newcastle in the Lake Macquarie district and at Camberwell, 12 miles north of Singleton and at Surat, Queensland.

Clarence River Basin Oil Exploration Co. is drilling a test hole north of Grafton. Sun Oil of California is drilling a test well near Maitland and hit fresh water under pressure at 506 feet.

In Queensland, Humber Barrier Reef Oils Pty. Ltd. drilled a stratigraphic test on Wreck Island, 100 miles east of Rockhampton. Planet Oil Exploration Pty. Co. has had geological surveys made in Central Queensland and plans to drill this year.

Associated Australian Oilfields N.L. plans a stratigraphic test later this year.

Oil Drilling and Exploration Ltd. has been awarded a contract to dig the deepest stratigraphic test well yet undertaken by the Bureau of Mineral Resources. At Beagle Ridge, W.A., 160 miles north of Perth, Western Australia.

Drilling began in July with a National T20 rig and the well will be carried to a depth of about 4,500 ft. It is expected to take about three months.

British Borneo: The last few land locations with possibilities are being drilled up now, and interest has settled offshore. A drilling platform, the "Orient Explorer," will begin drilling this month (September) off Brunei and later off the other two states of British Borneo.

Burma: Burmah Oil Co.'s Kyaiklat well No. 1, bottomed at 11,990 ft, was reported as sufficiently promising to justify further drilling in the Irrawaddy delta area. A new well is drilling near Dedaye, and seismic work is being continued farther north to find other suitable areas for exploration drilling. Meanwhile, Ondwe well No. 7 has been completed at 8,869 ft, and production tests are in progress.

Formosa: One heavy rig is in use, newly purchased to explore down to 15,000 ft. Six other rigs are in use mainly for reconditioning wells.

Indonesia: The lack of a new oil law or concessions under the existing one has cut exploration down to a minimum. There are no rank exploratory wells drilling now, with the exception of some by Caltex within its old concession areas.

India: Standard Vacuum is currently drilling, using one rig. The Indian government is also drilling actively using Romanian rigs and crews. It is currently testing gas, found under heavy pressure at 90 meters depth at Mahuvej village, about 30 miles from Surat. Some oil traces were reported. Another wildcat in the Cambay area had a reported show at 5,000 ft. It is near Lunej where India's Oil and Natural Gas Commission reportedly found oil last year.

Stanvac's current well, Memari 1, was at 11,257 ft on August 15 and in sand, limestone and carbonaceous shale. No shows are reported.

Japan: Japan Petroleum Exploration Co. has completed its best well to date in a new pool in Sarakawa field, northern Honshu. The company has an offshore rig operating off the coast of Akita, Yamagita and Niigata prefectures. It is currently drilling on one of four anticlines. A marine drilling program in about 3 feet of water is also underway with one rig.

Netherlands New Guinea: The recent oil find at Papua has stimulated some interest but no exploratory wells are known to be drilling now.

New Zealand: Shell-BP and Todd Oil Services Ltd. are drilling New Zealand's first modern exploration well at Kapuni, near Hawera, in the Taranaki province on the west coast of North Island, on a structure clearly defined by seismic surveys. The operations are being carried out by Shell, and the well is planned to go to about 12,000 ft.

Pakistan: Stanvac spudded its first wildcat in East Pakistan early in March, near the town of Bogra, with a rig moved from West Parkistan. The well, Mari 3, is at 8,436 ft (as of Aug. 15) and in shale.

Pakistan Petroleum, Ltd., has mapped a record drilling program for 1959, including five or six wildcats.

At least 50,000 ft. of hole will be drilled under its $5.9-million budget for this year. Four wildcats will be drilled in West Pakistan, one in East Pakistan, and a possible

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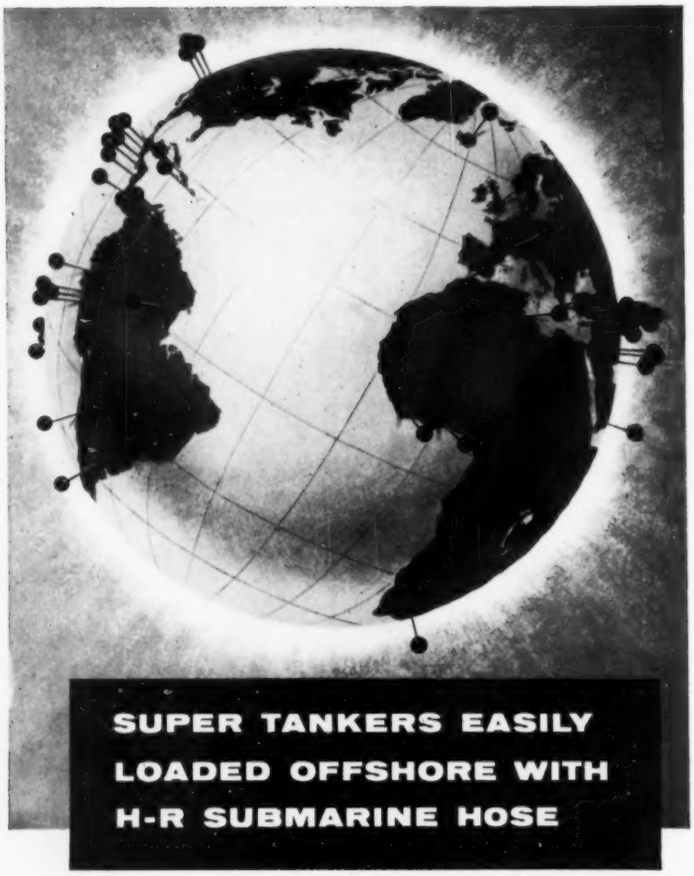

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sixth at a yet-undetermined location. PPL's natural gas finds in both parts of the country are the only commercial discoveries thus far established. Pakistan Petroleum Ltd. has discovered a new natural-gas reserve at Chhatak, Sylhet district, 25 miles north of its Haripur discovery of 1955.

Pakistan Shell is drilling its second exploratory test in West Pakistan. It is at Karampur, 56 miles southeast of Multan. Five-mile road made to drilling site.

Papua: Drilling is well in progress in the second deviated hole from the Puri No. 1 discovery well. Australasian Petroleum Co. Pty. Ltd. said a deviation was made from the original hole at 3,871 ft. The new hole has since been deepened to 7,334 feet. At the new well site at Bwata, 15 miles from Puri, a rig is being set up.

The Puri deviation is being drilled as a further test of the limestone formations in which oil was found in considerable quantities last year. Subsequently the flow was reported to have diminished.

A first deviated test ended in May after having produced some oil between 7,498 and 7,528 ft. This strike in the original well was made between 7,460 and 7,508 feet.

Siam: The government is drilling two exploratory wildcats in the central plain.

Timor: Tradewinds Exploration Inc. began drilling at Timor, Australia, in mid-July. The well is at South Ossulari, 25 miles southwest of Aliambatu, 2½ miles from the coast. Tradewinds will drill a total of 15,000 feet to qualify as a partner in Timor Oil Pty. Inc. This will involve two or more wells. Tradewinds' first well will go to a maximum of 7,500 feet.

Europe

Spain will take the spotlight this year, when new concessions are granted there. Meanwhile, France continues with a series of small lucrative finds. Europe may never be entirely self-supporting in oil but with the help of gas (possibly from Algeria) she may sometime nearly be.

Austria: The government will drill 127,073 ft for production and 164,050 ft for exploration during this year, part of an overall $20.5 million investment program. RAG, principal private operator, is drilling Puchkirchen No. 4 and Ried No. 1, in Upper Austria province.

Denmark: Danish American Prospecting Co. (SONJ) has given up after 21 years and after expenditure of more than 90 million kroner (over $13 million) It has found only minor traces of oil in three wells and drilled a number of dry holes.

France: A number of small, but commercial strikes have been made in France, particularly in the Paris basin, recently. Wildcats are presently drilling by Caltex, Shell, RAP, Cie d'Exploration Petroliere, and others. One of the more important finds, now being drilled, was by the Compagnie des Petroles du Sud-Est Parisien at Saint Martin de Bossenay, some hundred kilometers southeast of Paris. This new find is within about 30 kilometers from Chailly-en-Biere (CEP), Chateaurenard (Propex), and Granville (RAP) previous discoveries in the Paris basin. The pay zone is the limestone at the top of the Dogger, as in Coulommes, the most important field in the region. At Saint Martin de Bossenay,

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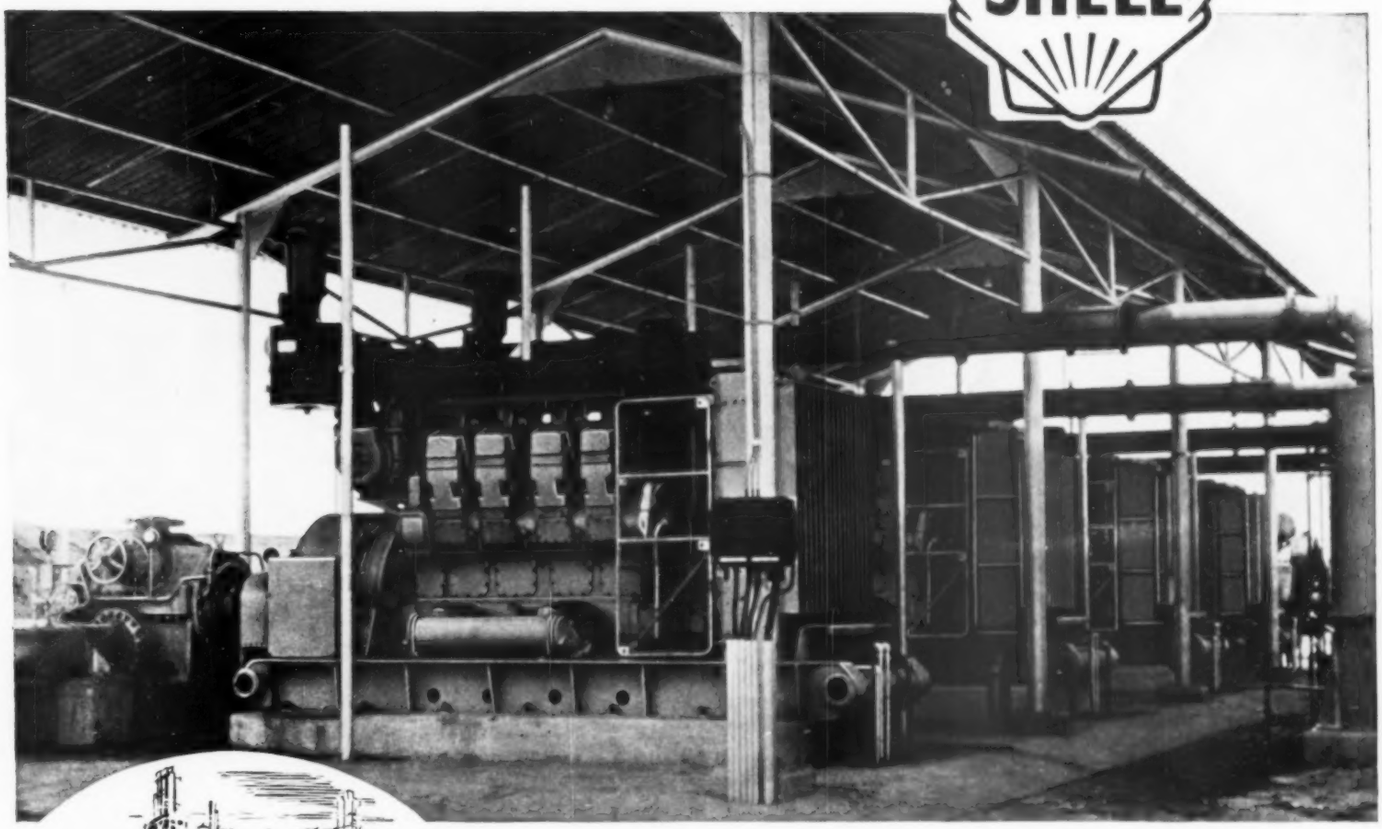

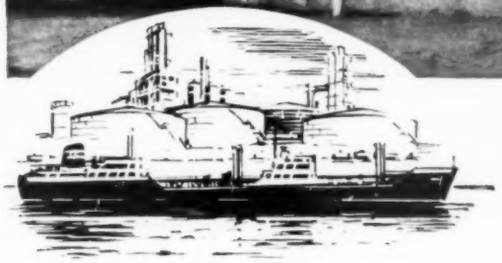

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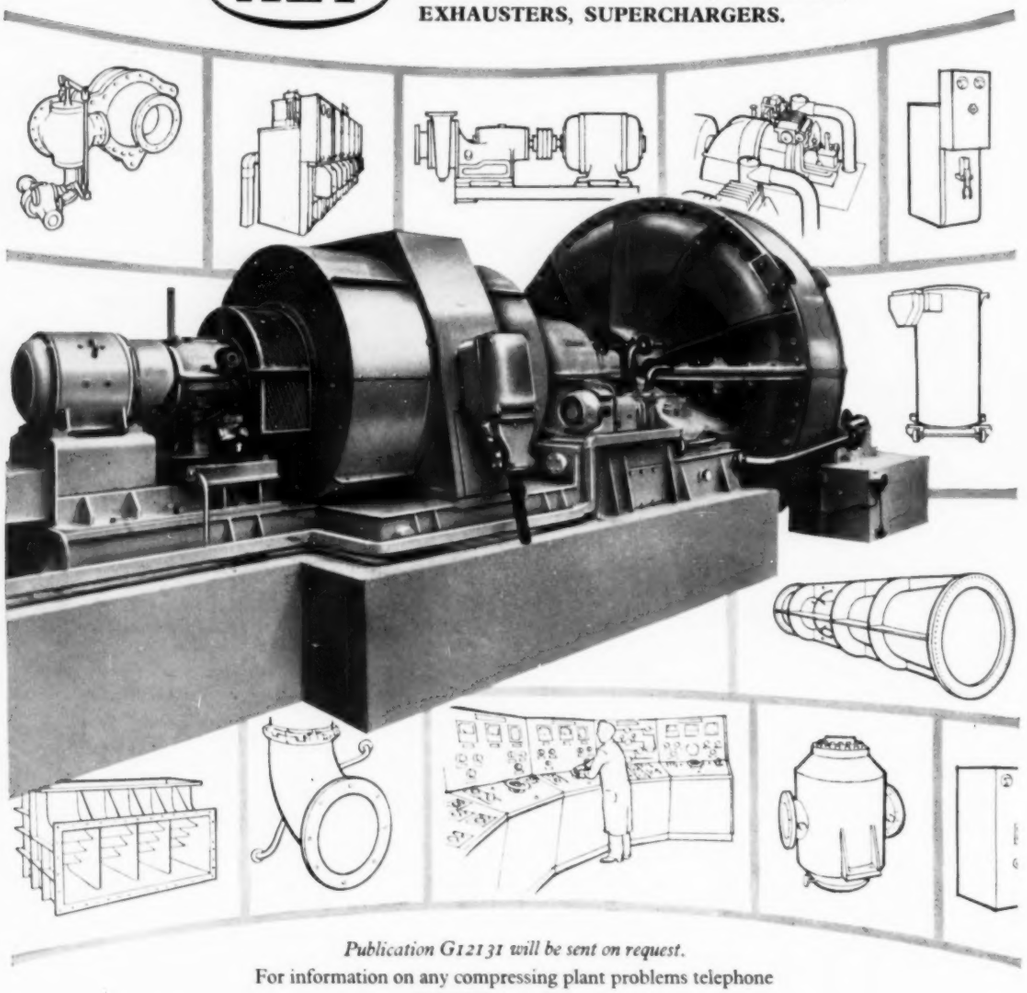

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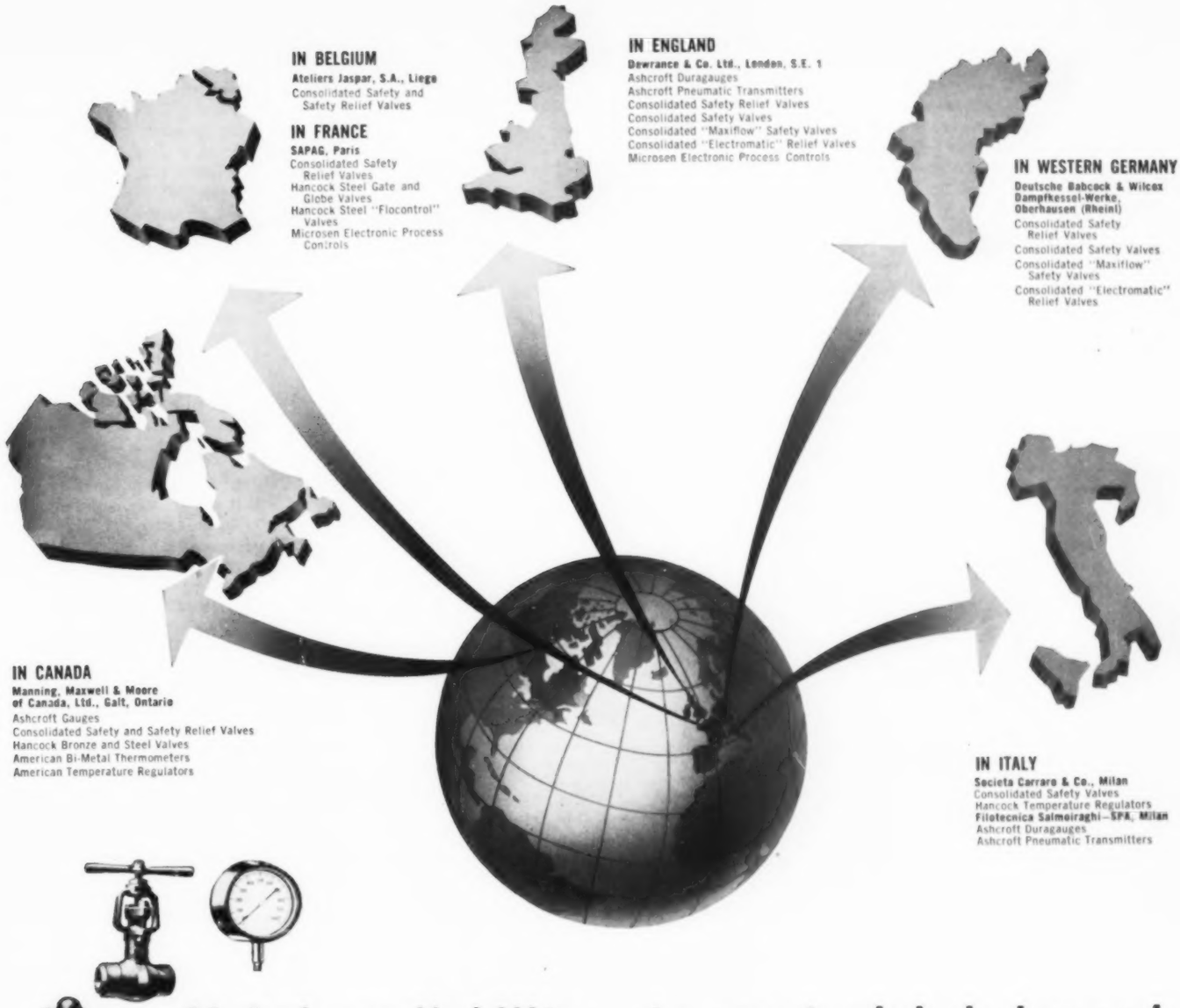

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the top of the Dogger was found at 1,371 meters, whereas it is about 300 meters lower in previous finds. A test conducted gave 3,400 liters in 90 minutes of anhydrous light sweet oil 33.2° API. The well is being drilled further. More wells are being drilled on the structure to define its limits; surveys are being made to determine new locations. COPESEP is an affiliate of the Shell Group by Shell Francaise, 50%; Compagnie des Products Chimiques et Raffinerie de Berre, 35%; and SAFREP (govt-controlled), 15%.

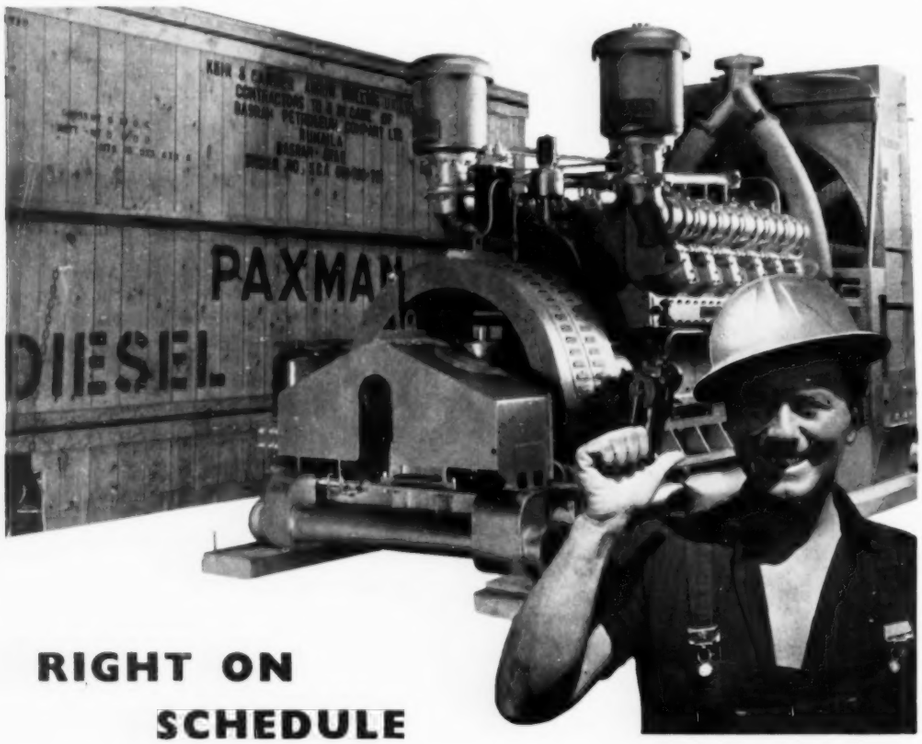
ESSO-REP: Landes Permit: Parentis 38: Reached 2,685 meters in Dolomitic series. *Casaux:* Met an impregnated horizon at 2,500 meters; is being completed, at 3,374 meters, in clays and sandstones, probably of Jurassic age. Testing of producing structure is under way. *Le Piquex:* Reached limestones of Upper Aptian, depth 2,274 meters at said date. *Morlaas:* Reached 3,572 meters in marly limestones of the Albian series. (This is a joint venture with 30% of C.E.P.)

COPESED (RD Shell): Aube et Yvonne Permit: Sainte-Martin de Bossenay No. 2 bis: deviated (about 17°) and reached 830 meters in Upper Jurassic on July 23rd. *S.M.B. 3:* Reached Dogger at 1,412 meters where fluorescent shows were noted. Testing started at 1,480 meters and are under way. The producing formation is provisionnally estimated at 40 meters.

PETROREP: 28 wells are productive (out of 29 drilled) on the Coulommes field. *Dammartin Permit: BE 2:* Started on July 16; reached 1,038 meters in the Creataceous on July 21. *BF 11:* Started on July 16; reached 1,050 meters.

S.N.P.A.: On the *Lacq field*, following wells are being deepened in the producing structure: (Depth of July 21) *Lacq 127* 4, 129 meters, core-drill 5¾. *Lacq 117:* 4: 652 meters, 6¾. *Lacq 124:* 4: 613 meters, 5¾. *Lacq 109:* Being completed before production. *Lacq 111:* At 4,530 meters waiting for a servicing tool to drill in the producing structure. Other wells at same date. *Lacq 108:* Alternately drilled with rotary and turbo-drill, reached 3,675 meters in Lower Aptian. *Lacq 110:* 4,451 meters in the Neocommian, reached at 4,443 meters. *Lacq 112:* Turbodrill 10" reached 2,404 meters in the Albo-Aptian. *Lacq 126:* Reached 4,557 meters in the Neocommian, entered at 4,452. *Lacq 128:* 3,431 meters in Lower Aptian. *Lacq 132:* 1,286 meters in Albian. *Aquitaine Permit:* (same date: July 21) *Nay 101:* Stopped July 11 at 1,972 meters in Turonian. *Estibau 101:* 3,292 meters in Marls and limestones of the Albian. *Monein 1:* 1,303 meters in marly clays of the Senonian. *Cagniote 101:* 1,810 meters in Ecocene marls. *Bordenave:* Stopped July 6 at 1,254 meters in Senonian. *Rhodanian Basin: Savasse* reached 376 meters in Hauterivian, after having had total losses at 154 meters on July 12. Lorraine Basin: *Pont-a-Mousson 1:* (50 50 with PREPA) reached 2,392 meters in Westphalian.

Regie Autonome Des Petroles: On the RAP permits in the Haute-Garonne and the Hautes-Pyrenees: *Richou No. 3:* Starting on July 20. *Charlas:* Rigging up. *Chalons-sur-Marne permit: Brie 106:* Completed July 16 at 1, 762 meters in limestones of the Dogger flooded with salt water. The drill was transferred to *Brie 107:* Now rigging up. *Brie 104:* Reached 1,633 meters in marls



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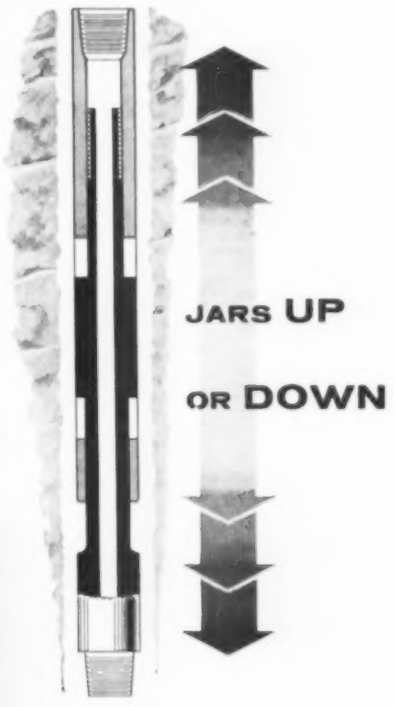

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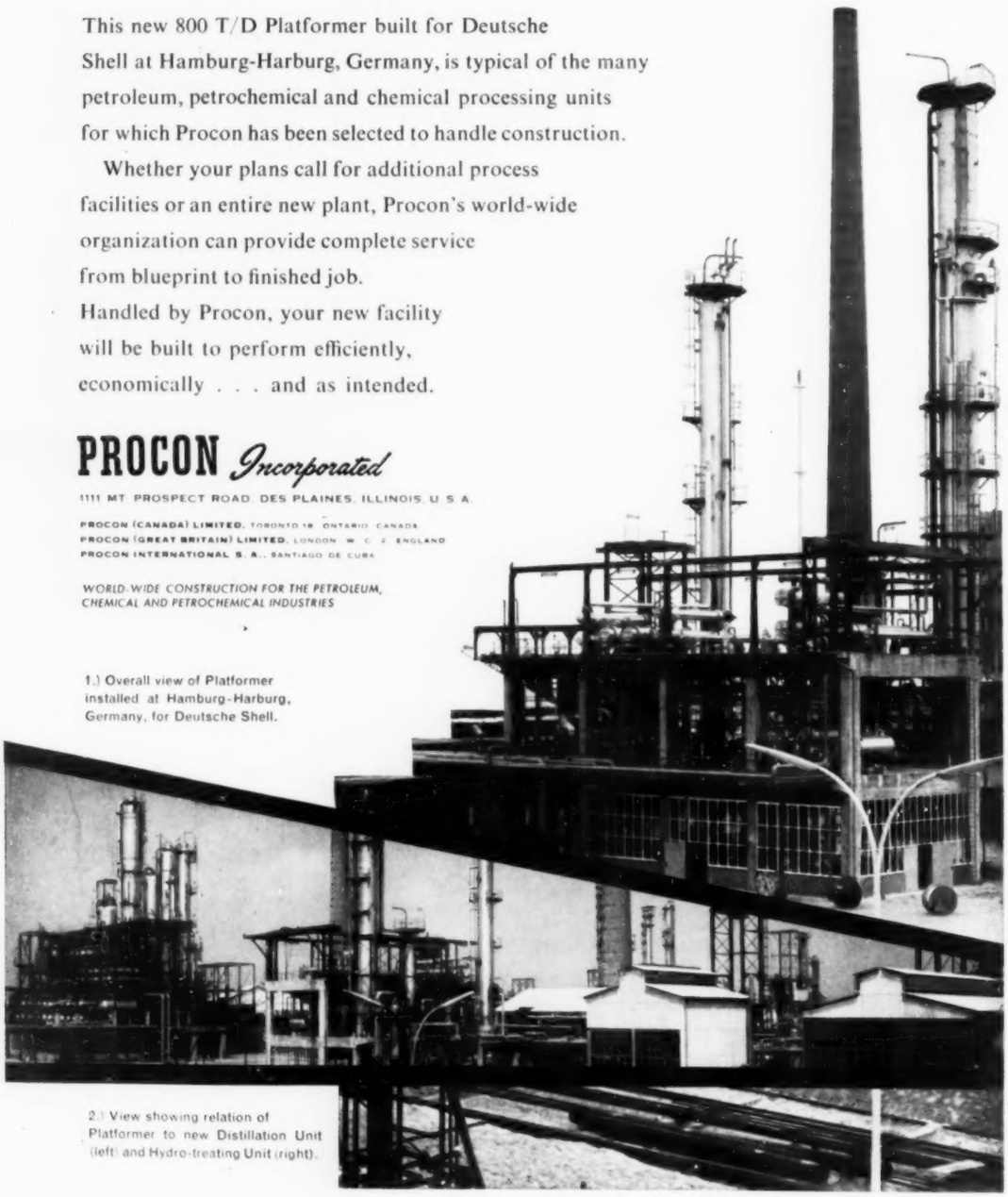
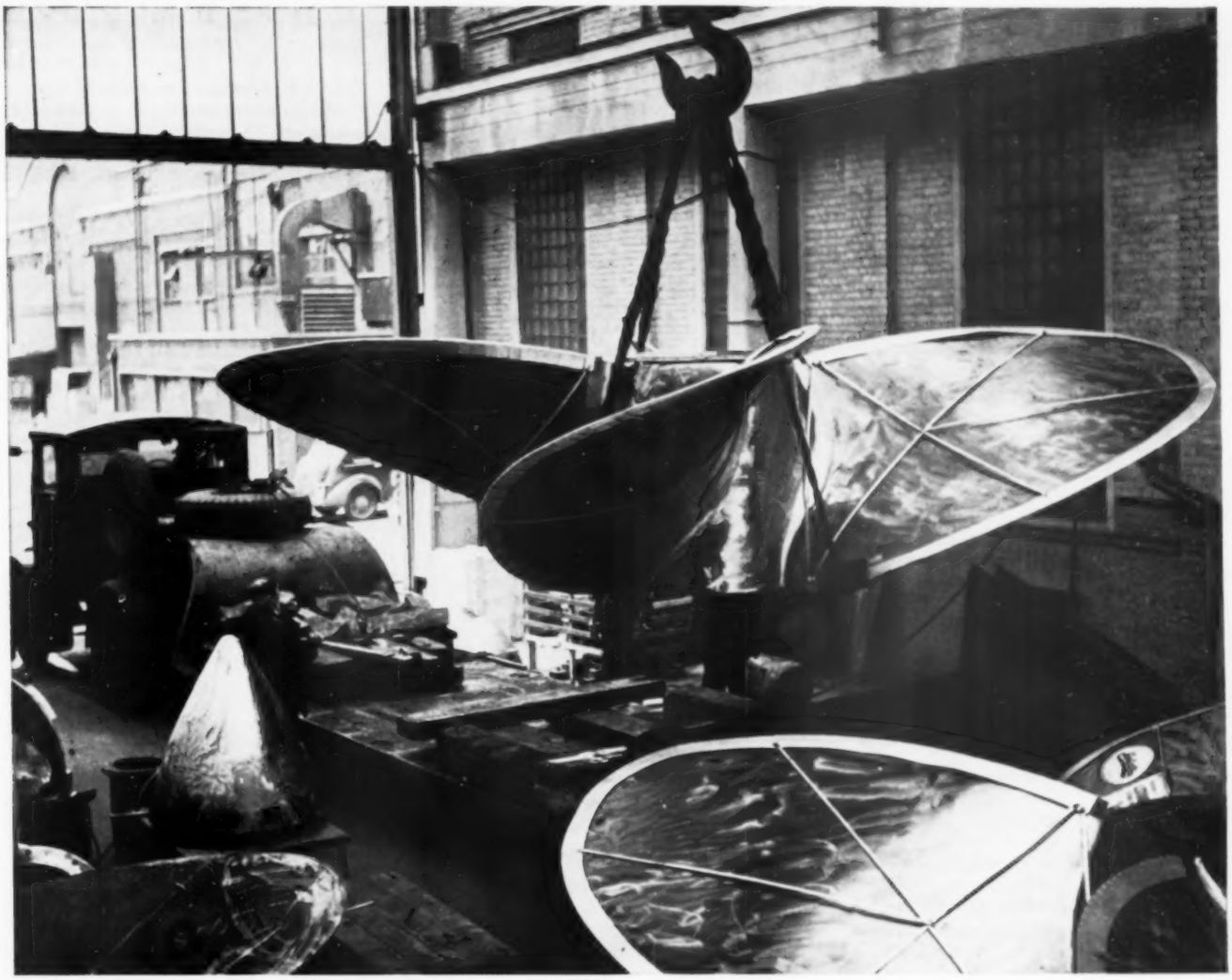


1.) Overall view of Platformer installed at Hamburg-Harburg, Germany, for Deutsche Shell.

2.) View showing relation of Platformer to new Distillation Unit (left) and Hydro-treating Unit (right).



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of Upper Jurassic. Bresse-Jura permit: *Bresse-sud 1:* At 2,299 meters in marls of the Lias. *Gannat Permit: Brout-Vernet 101:* Started July 7, stopped on the 12th at 394 meters and drill was moved to: *Barberier 101.*

C.E.P. (Compagnie d'Exploration Petroliere): Chailly 11: Started July 12, reached 1,069 meters in the Kimmeridgian. Daily production of Chailly oilfield was between 100 and 125 cubic meters during first half of July. Average barrels daily production per well varies between land 40. *Beaumont 1:* Reached Dogger at 1,569 meters and drilling continued 1,647 meters. *Mirambeau Permit: Mirambeau 1:* Stopped on July 5 at 691 meters in the Kimmeridgian and moved to the Etampes permit of the Chailly field.

FROPEX: 4 wells producing in CHATEAURENARD: 3, 4, 6 and 7. No drilling announced at above date.

Mobil Repga: Sabres permit: Garein 1 reached 1,974 meters in the Dolomites of the Senonian. A test operated between 1,711 and 1,729 meters in the Dolomitic chalky limestones of the Companian, yielded 585 liters of muddy water in one hour.

SEFREP: Franche - Comte permit (Haute-Soane): *Velesmes 1:* 1,072 meters in clays of Trias with anhydrites and dolomites. *Adour Maritime Permit: Ustaritz 1:* Reached 2,406 meters in ophite of the Trias.

PREPA: Houte-Savoie permit: Saleve 1 (joint venture with Transworld Petroleum for 20%): Reached 1,118 meters in sandy marls. *Cote D'Or permit: Barges No. 1:* Stopped July 6 at 611 meters in Lower Batonian and the drill was moved to *Barges No. 2,* started on July 8 and reached 696 meters in dolomitic limestones of Kimmeridgian. *Chablais permit: Mont-de-Boissy 1* reached 1,766 meters. *Lorraine permit: Pont-a-Mousson No. 1:* 2,392 meters in Westphalian (association 50/50 with SNPA-See above).

Societe des Petroles de Valence: Voiron permit: Saint-Lattier No. 2: Stopped on July 16 at 2,425 meters, after crossing the Trias, in the basement. The drill was moved to a new location on the *Permis de Beaurepaire: Claveyson.*

COPEFA: Die permit (Rhodanian Basin): Reached 4, 009 meters.

A new discovery, Brie 101 in Paris-basin, 30 miles southeast of Paris, is expected to produce 330 b/d of 35-gravity oil. Government's RAP encountered sulfur-free oil between 5,340-60 ft and 5,380-85 ft in Dogger limestone, with combined initial of 22 bbl per hour. Well is producing 740 b/d, with tests continuing.

Cie. d'Exploration Petroliero (French government-controlled company) is drilling on a new oil strike in Etampes area south of Paris. Perthes No. 1, west of Chailly en Biere (where two wells already produce oil), had oil shows at 1,669 meters.

Greece: There is no drilling at present, but the new oil law has attracted some major companies in the past two months, and some drilling may commence soon.

Italy: Exploration by private companies is curtailed, with no drilling underway by them. ENI, the government's oil company, is actively exploring, and recently announced two discoveries in Southern Italy at Lucania. The company currently has two wells drilling in the southern Italy area.

Netherlands: One exploratory rig is working within the confines of NAM's concession area. No major finds have been reported recently.

Portugal: Two rigs are exploring, operated by Socony Mobil for CPP (Cia. de Petroleos de Portugal). No discoveries are reported.

Sicily: An offshore rig, originally destined for Iran, has been diverted by ENI to Sicily and is now drilling on an extension of the Gela field offshore. Gulf Oil is drilling a deep test at Ragusa, which went below the levels of present pay with no results known so far. Another wildcat, Rocca, may still be drilling.

Spain: There are currently a few wildcat wells drilling, mainly by Valdebro, but interest is awaiting award of the oil areas when sealed bids are opened. About 20 companies are interested.

Valdebro, owned principally by General American Oil, Dallas, Texas, recently made a discovery at Retuerta 1, north of Burgos. From 7,853-7,941 ft the well flowed for about 3 hours and recovered 1,000 ft of water cushion and 710 ft of mud cut with much green oil. The well is testing now. Pressures are low. Valdebro is using 3 wildcat rigs.

United Kingdom: BP Exploration is doing some exploratory work but without great success as yet. The latest discovery reported was a wildcat in Lincolnshire, England, Gainsborough No. 1, that tested 110 b d from 4,600 ft, 2½ miles west of a discovery at Corringham during 1958. Gainsborough No. 1 is reported England's deepest well.

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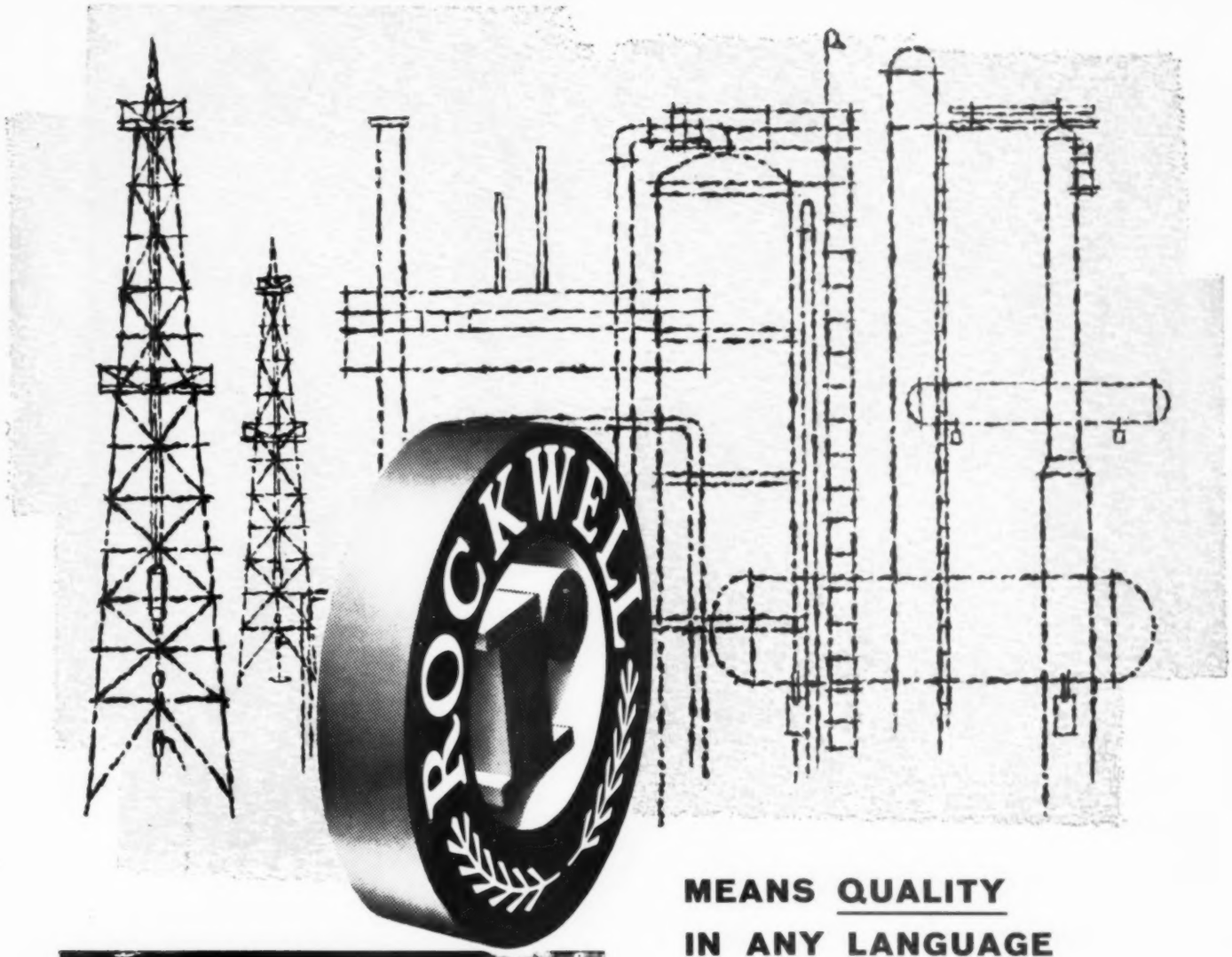

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International Division

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Uhl Joins World Petroleum

William C. Uhl has joined the editorial staff of World Petroleum as Processing Editor. He brings with him a background of 22 years' experience in the petroleum and chemical industry and in petroleum magazine editing.

A 1937 graduate of Fenn College, Cleveland, with a B.S. in Chemical Engineering, Uhl was first associated with the paint industry as a chemist. He joined Lubrizol Corp. in 1941 as a chemical engineer and moved through pilot plant work and production supervision responsibilities. In 1946, Uhl became a member of the editorial staff of Petroleum Processing; and was named managing editor of that publication in 1954. When the magazine was discontinued in 1957, Uhl joined Esso Research and Engineering Co. in the public relations division, a post he held until moving over to World Petroleum.

A native of Philadelphia, Uhl was educated in Cleveland and lived there until moving to the New York area in 1953. He now makes his home with his wife and three children in White Plains, N.Y.

Earnings Up Again

Oil company earnings in the first half of this year swung substantially upward in comparison with the same period in 1958. The rise was nearly 27%, on the basis of the 41 companies shown in the table below.

Total earnings for these 41 companies in the first half of 1959 were $1,335,739,000; for the first half of 1958 they were $1,055,555,000. Only one concern in the list reported a loss during this year's first half; however, it too showed a gain over last year.

OIL COMPANY EARNINGS, FIRST HALF, 1959
(In Thousands of Dollars)

COMPANY	NET INCOME		PER SHARE	
American Petrofina	355	—29,297	—	—
Anderson-Prichard Oil	3,044	1,377	$1.71	$0.71
Argo Oil Corp.	2,411	2,330	1.24	1.20
Arkansas Fuel Oil	3,029	3,323	0.80	0.87
Atlantic Refining	16,400	7,667	1.74	0.78
Clark Oil & Refining	1,006	222	0.68	0.15
Colorado Oil & Gas	1,034	595	0.24	0.10
Commonwealth Oil Refining	—592	—973	—	—
Creole Petroleum	115,500	117,200[1]	1.49	1.51[1]
Crescent Petroleum	1,382	146	0.66	0.10
Delhi-Taylor Oil	1,460	715	0.28	—
El Paso Natural Gas	6,105	7,859	0.23	0.35
Felmont Petroleum (formerly Amer. Maracaibo)	1,315	942	0.34	0.24
Gulf Oil Corp.	141,814	115,737	4.38	3.57
Hudson's Bay Oil & Gas	970	735	0.05	0.04
Humble Oil & Refining	88,994	57,182	1.23	0.79
Imperial Oil Ltd.	23,334	24,153	0.74	0.77
International Petroleum Ltd	10,100	9,000[1]	0.69	0.62[1]
Louisiana Land & Exploration	9,169	8,861	1.02	0.99
Midwest Oil Corp.	2,516	2,535	1.38	1.32
Olin Oil & Gas	2,026	1,011	0.71	0.35
Phillips Petroleum	53,209	36,412	1.55	1.06
Pioneer Natural Gas	3,062	1,611	1.85	1.10[2]
Pure Oil	13,148	10,675	1.51	1.24
Richfield Oil	10,695	10,410	2.65	2.60
Sinclair Oil Corp.	27,032	22,356	1.76	1.45
Sinclair Venezuelan Oil	6,182	8,646	1.54	2.18
Skelly Oil	14,523	10,549	2.52	1.83
Standard of California	118,153	116,735	1.87	1.85
Standard of Indiana	78,851	52,423	2.20	1.47
Standard of Kentucky	6,743	6,301	2.59	2.42
Standard (New Jersey)	315,000	249,000[1]	1.47	1.22[1]
Standard of Ohio	13,290	11,436	2.67	2.29
Sun Oil	21,974	11,560	1.87	1.01
Sunray Mid-Continent	19,936	19,251	1.05	1.01
Texaco	162,723	138,536	2.79	2.37
Texas Pacific Coal & Oil	1,621	857	0.94	—
Tidewater	18,600	279	1.24	0.09
Union Oil of California	10,772	11,457	1.32	1.40
Union Oil & Gas of Louisiana	6,675	4,091	1.41	0.86
Wilcox Oil	423	369	1.35	1.22
Woodley Petroleum	1,755	1,281	2.06	1.56
Totals	$1,335,739	$1,055,555		

Minus signs indicate deficit.
[1]Includes retroactive increases in Venezuelan income tax rates.
[2]Adjusted.

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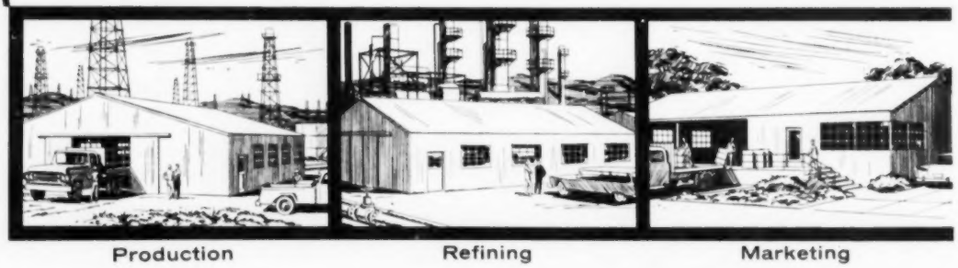

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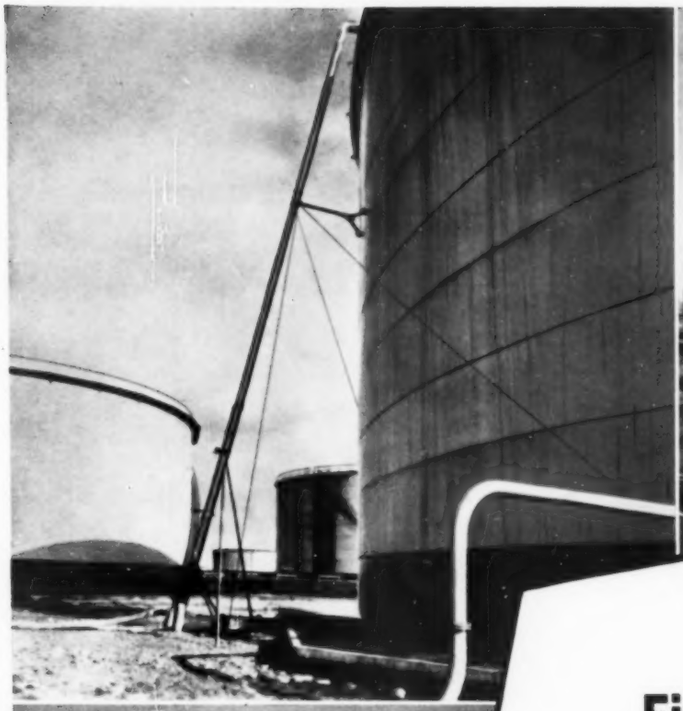

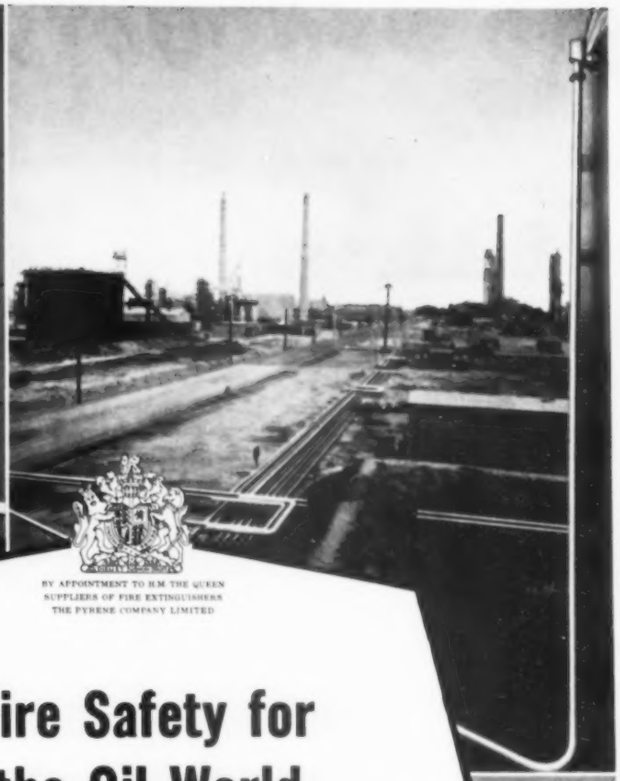

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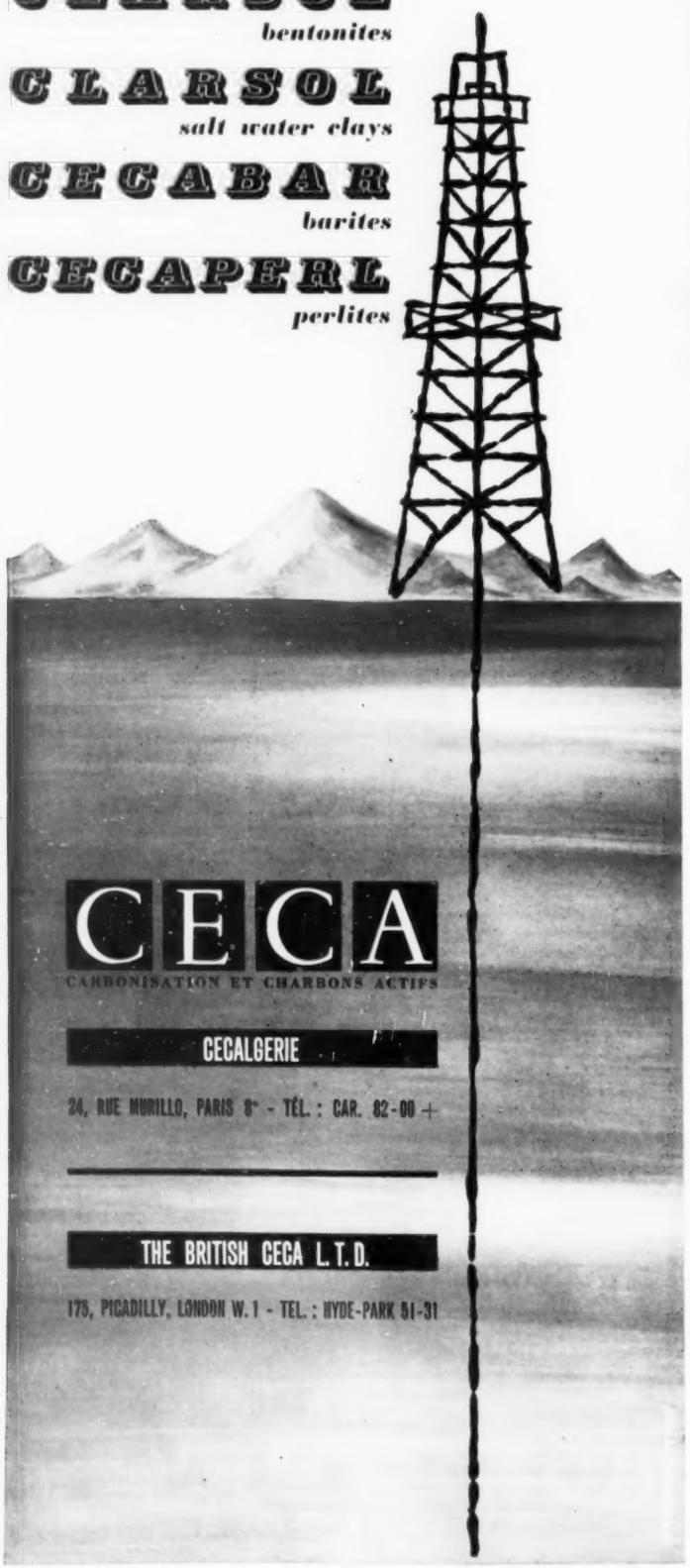

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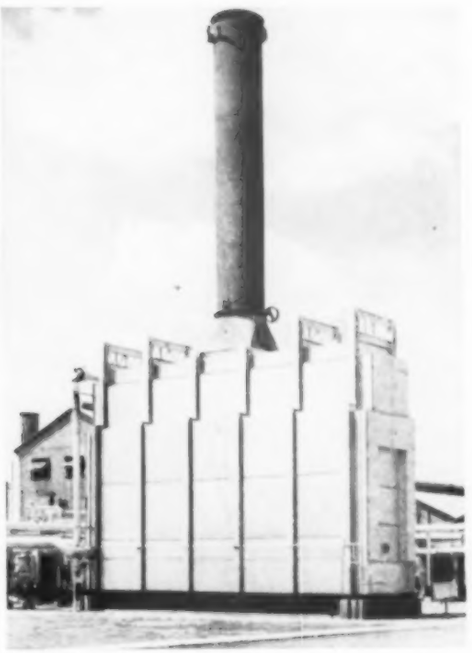

'Upflo' Heater

Important news for the Petro-chemical Industry: we now manufacture the full range of Born Heaters and enquiries are invited from all with special heating problems to solve. Incorporating many unique points, Born has well earned its title—"The World's Finest Heater". Developing over 85% heating efficiency, without costly blowers, fans or other mechanical equipment, heaters range from under 500,000 to more than 200,000,000 BTU per hour absorption duty. Amongst Born special features is the airtight plenum chamber, safeguarding against external explosions, insulating heater from varying wind directions and velocities and providing positive wall cooling. Flow of liquid to be heated is counter to direction of combustion gases, reducing fuel costs and providing higher efficiencies. Safety features include explosion doors on roof, safety pilots on each burner, observation ports and access doors.

For Ethylene and other processing, demanding very high temperatures, the "Bornflo" Heater is of especial interest. Suspended tube arrangement prevents sagging at extreme temperatures and exact heat control is provided by variable heating zones. Catalogues describing the full range of Born Heaters are available on request and our technical staff will supply specifications to meet all requirements.

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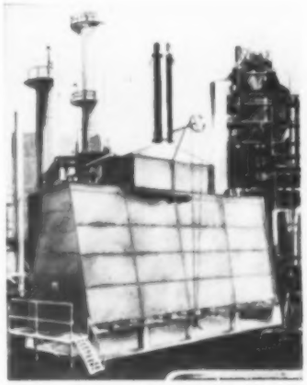
Vertical Heater



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from the field had the process not been put in operation.

The project continues to produce at a top allowable of 15,000 b/d. Atlantic anticipates that the ultimate recovery from Block 31 will be in excess of 150 million barrels. Most of this is attributable to the successful application of the miscible displacement process.

Rate of production at Block 31 during the period has ranged from 13,000 to 15,000 barrels per calendar day, compared to something less than half of this before the project began.

New Publication

Requirements for Success in Oil Exploration and Development, with Particular Reference to the Oil Possibilities of South-East Asia and Australasia. By P. Leicester, M.A. (Oxon), F.G.S. A document submitted to the ECAFE Petroleum Symposium in New Delhi, India, last year. Valuable because it is written along rather different lines. It reviews the various factors in oil finding such as the geological factors governing oil prospects in Asia and Australasia. The risks and expectation of return in oil exploration are also covered. A series of maps, including one of prospects in Asia, accompanies it in color. The publication is by Asiatic Petroleum Corp., 50 West 50th Street, New York 20, N.Y.

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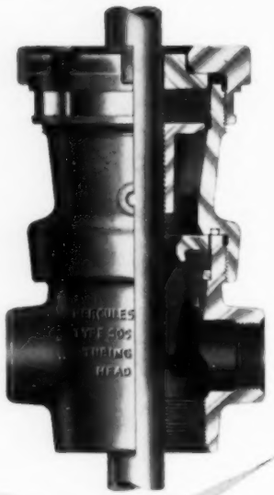
HERCULES TYPE SOS

TUBING HEAD

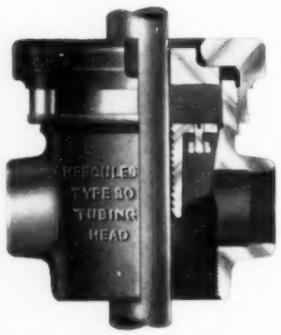
Hercules "Type SOS" is a 4000 pound test stripper tubing head. The lower section contains the neoprene tubing stripper, the upper section or bowl contains the slips and packing arrangement. The SOS is unsurpassed for use in well servicing operations in addition to its use in flowing wells.



HERCULES TYPE SO

TUBING HEAD

Hercules "Type SO" tubing head is actually the lower section of the "Type SOS" tubing head, containing the slips and packing arrangement. It is particularly suitable for pumping due to its compactness, being approximately 12 inches high.



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Bandini Buys Long Shot Oil

Bandini Petroleum Co. has acquired (in exchange for shares of its common stock) the assets of Long Shot Oil Co. Ltd. Long Shot Oil Co. has producing properties in West Texas, East Texas, and Oklahoma. At the present time properties owned by Long Shot Oil are producing approximately 360 barrels of oil and 742 Mcf of gas per day.

Arabian Gas For Sale

The Arabian American Oil Co. has announced that natural gas is available in Saudi Arabia for purchase from Aramco. "It is the hope of Aramco," the company said, "that low price and favorable contract terms will induce new industries to utilize such gas for fuel, for chemical processing or for other purposes."

The total gas available this year is estimated at 163 mmcf/d. The figure is expected to rise to 201 million in 1960 and to 214 million in 1961. Additional gas may become available for sale as new fields are developed or present fields expanded.

New Italian Oil Publication

Italian Petroleum News, IPN, is a bi-monthly news letter on the Italian oil industry. It began publication on July 15, 1959. Published in English, it is an excellent source for information on Italy's oil industry and the only one of its kind that is published regularly. Judging by the first edition, it will cover all industry phases from exploration through marketing. Subscription rates for July 15 through December 31, 1959 are $12.00 (U. S. currency) by air mail to any country outside Italy. Within Italy the price is 6000 lire. Publisher is the Centro Studie Pubbliche Relazioni Petrolifere, via Carducci 2, Rome, Italy.

Spanish Geophysical Company Expands

A new branch of Geofisica Rogers, C. A., an affiliate of the Rogers Geophysical Company, has been opened in Madrid, Spain, according to Sam D. Rogers, head of the Rogers Companies. Manager is Lewis F. Judson. Headquarters are in the Castellana Hilton Hotel.

Expansion Joint Bulletin

A six-page bulletin on Badger S-R Expansion Joints is available from the Expansion Joint Division of Badger Manufacturing Co., 230 Bent St., Cambridge 41, Mass.

Shell Buys Canadian Eagle

N. V. Koninklijke Nederlandsche Petroleum Maatschappij (Royal Dutch Petroleum Co.) and the "Shell" Transport and Trading Co., Ltd., have announced that shareholders of Canadian Eagle Oil Co., Ltd., have accepted the offer from Royal Dutch and "Shell" Transport to acquire the whole of the assets and business of Canadian Eagle.

Porous Media Explored In New Film

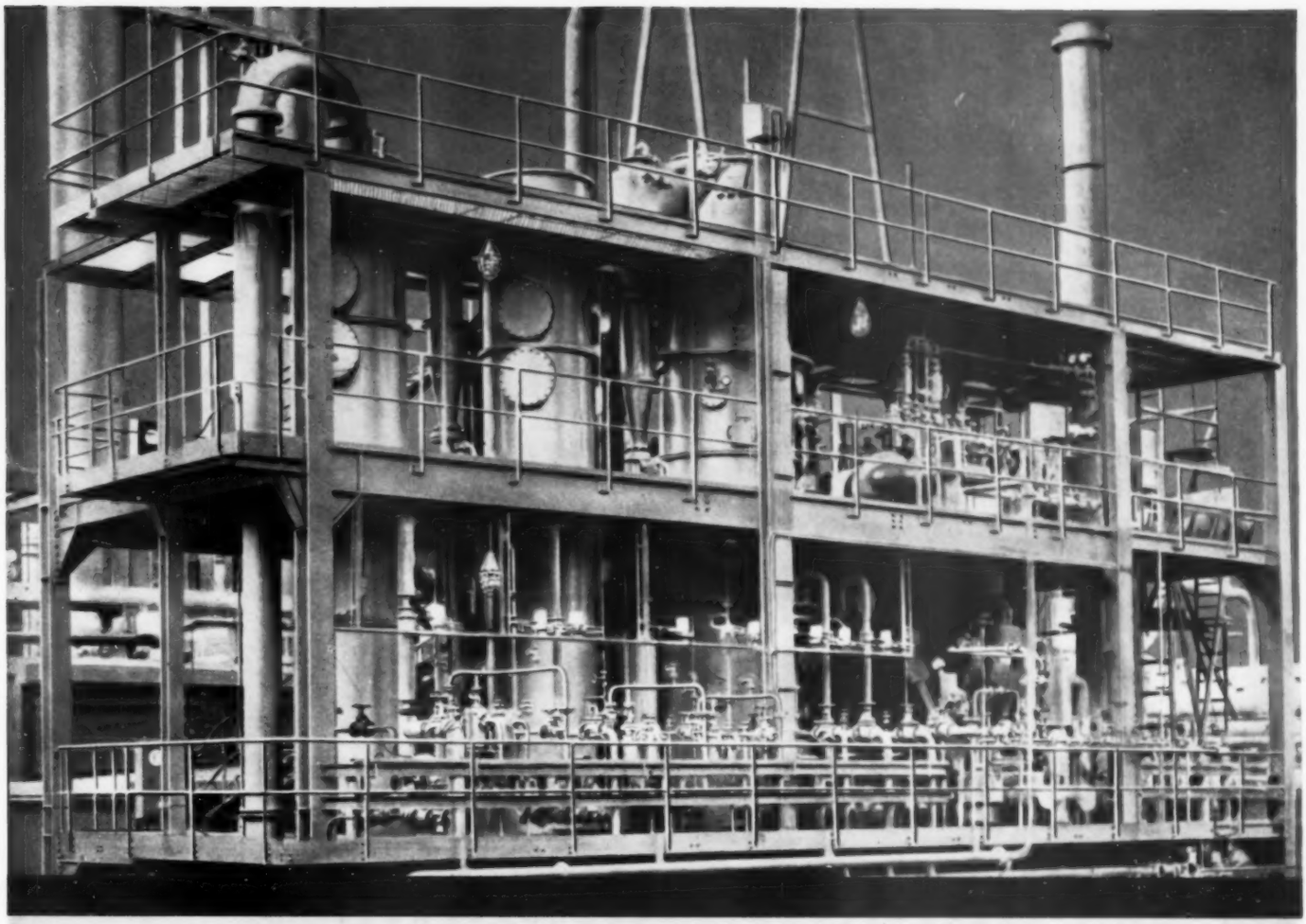
The dynamic interaction of oil and water in a sand matrix is vividly depicted in "Laboratory Research on Fluid Flowing Through Porous Media—Surfactants in an Oil-Water-Sand System," a twenty minute color movie available for loan from Haliburton Oil Well Cementing Co. Those interested in borrowing this movie should write to: Keith James, Technical Center, Haliburton Oil Well Cementing Co., Duncan, Oklahoma.

Foreign Sales Appointments

Two new appointments in its foreign sales and development department have been announced by Phillips Petroleum Co. George M. Brooner has become an assistant manager of the department's patent licensing and market development division with offices in New York City. E. E. Ratekin has been named the department's Tokyo, Japan, representative.

HARRY CAMERON

Harry Oliver Cameron, former Sun Oil Company executive who retired in 1955 after more than 50 years with the company, died recently. He was 89. He first joined Sun in April 1904 as an auditor. He was appointed assistant to the vice president in charge of manufacturing and production in 1944.



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Literature on all aspects of our products is available on request.

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BRANCHES AND AGENTS THROUGHOUT THE WORLD

Opens New Plant

Flick-Reedy Corp. recently moved into a new $2.3 million plant at Bensenville, Ill., near Chicago's O'Hare airport. The company manufactures cylinders, boosters and accumulators.

Dallas Honors Argentine Oilman

Dr. Francisco P. De Luca Muro of Buenos Aires, former executive of Yacimientos Petroliferos Fiscales, was recently proclaimed an honorary citizen of Dallas at a reception tendered by W. H. Davison, president of Tekoil Corp., D. W. Varel, president of Varel Manufacturing Co., and Alfred E. McLane, a director of Tekoil Corp.

Slim Hole Equipment

The Hercules Tool Co. of Tulsa has recently developed and is marketing a line of slim hole drilling production equipment to meet the increasing use of 2½" tubing for casing and 1¼" or 1½" tubing as the oil string. The upper part of the slim hole well hook-up is a Hercules tee type duplex stuffing box for 1¼" or 1½" tubing sizes. This combination tee and stuffing box has a female thread and screws directly onto the tubing, eliminating one threaded connection and resulting in a considerably shorter hook-up. The lower part has a one piece tubing head with pressure cast body and 2" side outlets.

Named Reed Division Manager

Charles B. Caldwell has been named division manager of the West Texas Area for the Reed Roller Bit Co. to succeed Steve Hazlip. Reed's West Texas Division headquarters are in Odessa, Texas.

Winfrey Joins Petty

Don B. Winfrey, formerly chief geophysicist for City Service Petroleum, Inc., has joined Petty Geophysical Engineering Co. as assistant to the president, in charge of all geophysical operations.

Hughes Appoints Morlan

Appointment of Erwin A. Morlan as assistant director of research has been announced by Dr. Daniel J. Martin, vice president-engineering, Hughes Tool Co. Mr. Morlan, a member of the Hughes engineering and research organization since 1938, has 14 inventions upon which patents have been issued or are pending. He is co-inventor of the Hughes "chert" bit and sole inventor of an "insert" bit developed for mining operations.

Venezuela Sales Appointments

Oil Field Sales & Service, S.A., subsidiary of U.S. Industries, Inc., Maracaibo, has appointed Bill Richards, Richard Roman and Mitch Breedlove as district managers and Grady Rodgers as general manager of its wire line service. Bill Richards has been appointed manager of the Western Venezuelan District and Richard Roman manager in Eastern Venezuela. Mitch Breedlove heads the Colombia District. Grady Rodgers has been appointed general manager of Oilfield Wire Line Service, S.A.

Massey Appointed At UOP

Universal Oil Products Co. has appointed Dr. L. G. Massey as head of the UOP computer department. "By providing the means for rapid solutions to a variety of complex problems, Universal's computer department has proven a valuable asset to the company and its customers," Mr. M. P. Venema, president, said in announcing the appointment. Dr. Massey joined Universal's pilot plant division in 1951. In 1957 he was appointed assistant head of the computer department.

Describes Engineering Services

Frederic R. Harris, Inc., consulting engineers, New York, have prepared a booklet describing services offered to the petroleum and other industries. Clients served in offshore drilling, piping, port and dock construction are listed.

E. A. Morlan

E. E. Parker

Heads UK Cameron Operations

Edward E. Parker has been appointed managing director of Cameron Iron Works Ltd., England, a wholly owned subsidiary of Cameron Iron Works Inc., Houston. Mr. Parker went to Leeds in 1951 to assist in the initial manufacture of Cameron products in England, and in 1954 was made works manager. In his new position, Mr. Parker will direct sales and service, as well as manufacturing.

Heads International Marketing

William H. Heinlen has been named marketing manager for the international department of B. F. Goodrich Chemical Co. Prior to his new appointment, Heinlen had served as acting manager of international sales for the company. He will continue to report to Robert P. Kenney, director of international activities.

Timken International Appointments

The Timken Roller Bearing Co. has announced five promotions in its foreign operations division. S. C. Partridge has been made director of sales; John B. Baker, chief engineer; J. Richard Wible, general auditor; Edward H. Hughes, manager of sales planning; and Charles L. Richey, manager of production planning.

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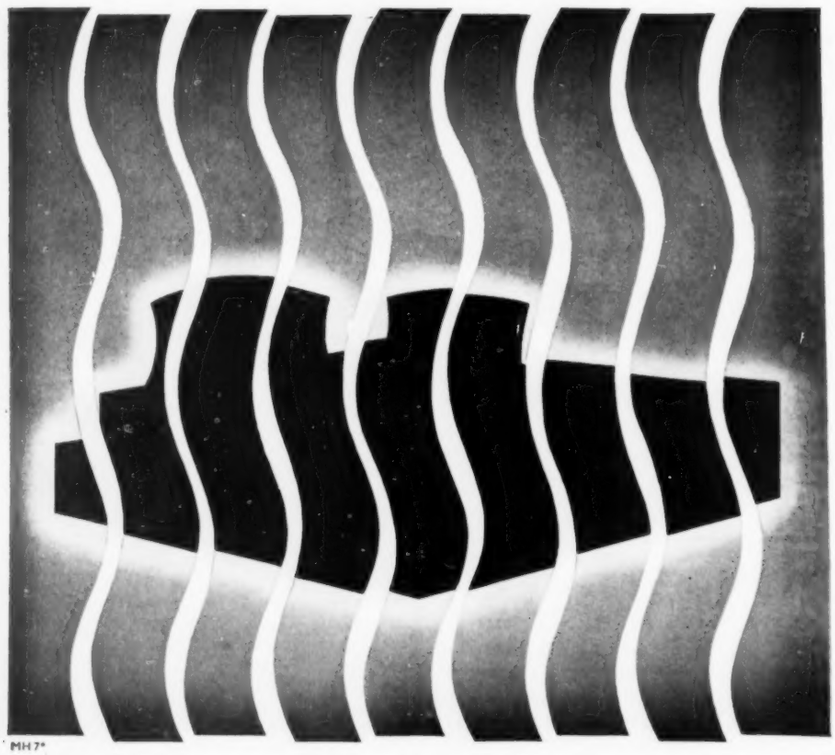

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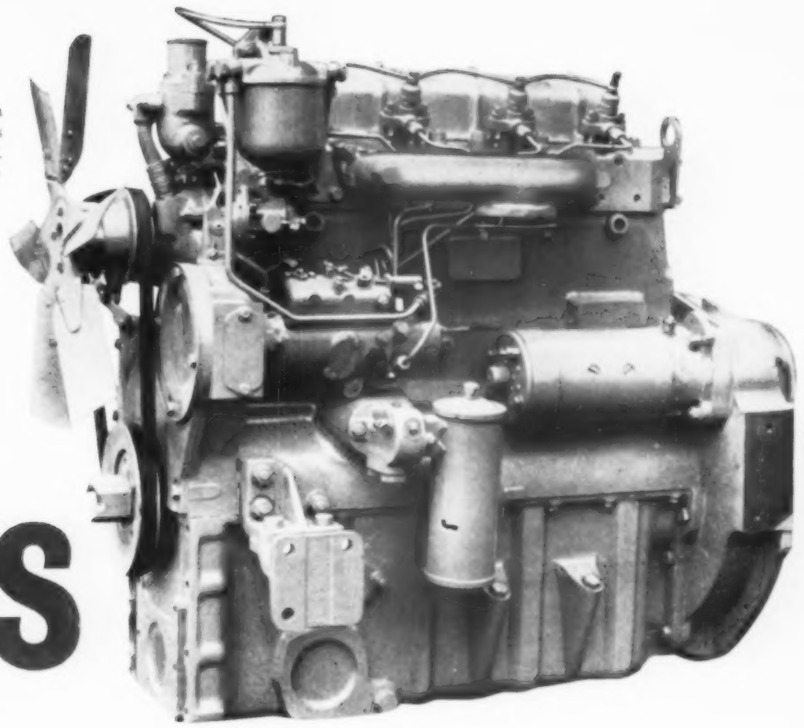

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2510

L. B. Levell

W. N. Kruse

Mid-Continent Supply Promotions

Mid-Continent Supply Co. recently named a New York office export manager, a South American agent, and six new division managers.

Named as export manager in New York is T. L. Ratcliff. R. L. McAnally has been promoted to division manager in the Denver office. J. O. Ramsey has been promoted to division manager in the New Orleans office. The new division manager in Houston is J. L. Voss; and W. W. Arnold is the new division manager in Midland, Texas. C. H. Hickman becomes division manager in Tulsa. R. S. Weilman is new division manager for Wichita Falls, Texas.

Assuming new duties in South America is L. B. Levell. From his Buenos Aires office, Mr. Levell will serve as Mid-Continent's agent for Argentina, Bolivia, Peru, Brazil, Chile, Paraguay, and Uruguay. He formerly was assistant sales manager in Fort Worth.

Stone & Webster Promotions

M. H. Cutler has been named engineering manager of Stone & Webster Engineering Corp., Boston and New York. Formerly assistant engineering manager, he succeeds Fred W. Argue, recently named executive vice president. Thomas A. Fearnside becomes assistant engineering manager, and Floyd F. Dedrick succeeds Mr. Fearnside as assistant chief mechanical engineer.

Kruse Joins Badger

W. Nicholas Kruse has joined the home office engineering sales staff of Badger Manufacturing Co., Cambridge, Mass. Before joining Badger, Mr. Kruse had been with Universal Oil Products Co. and later with Procon Inc.

Smith Oil Tool in Alaska

Appointment of Allen Oil Tool Co. as representatives for H. C. Smith Oil Tool Co. throughout Alaska has been announced by Arthur S. Marshall, vice president-sales. Headquarters of the firm are located in Seward, and principals are Kenneth and Chester Allen. The Alaskan company is represented in southern California by L. G. Robinson of Venice. The new representatives are under the direction of H. C. Smith Oil Tool Co.'s own staff representative, James E. Sayers, whose headquarters are in Edmonton, Alberta, Canada.

Accompanying photo shows Allen Oil Tool Co.'s warehouse in Seward, Alaska.

Core Labs Expands

Core Laboratories Inc., Dallas, has expanded its operations. New facilities have been recently established in Buenos Aires, Argentina, under the management of John Jorden, vice president; and in Bogota, Colombia, with James A. Cusator, vice president, in charge.

J. N. MacKendrick

F. W. Laverty

New Clark Bros. President

F. W. Laverty has been appointed president of Clark Bros. Co., Olean, N. Y., one of the Dresser Industries. He had been executive vice president since 1953, and previous to that sales manager. J. N. MacKendrick, president since 1953 and with the firm since 1928, has been appointed chairman of Clark Bros. Mr. MacKendrick continues his headquarters at Clark's executive offices in Olean, and replaces C. Paul Clark who has been given the post of honorary chairman.

Guatemalan Airlift

Twenty-five supply houses were represented recently in the shipment of major components for the biggest equipment airlift in oil-drilling history. More than $1 million worth of drilling equipment was flown deep into the Guatemalan jungle following shipment by boat from Houston, Texas, where the drilling rig and other equipment had been assembled by International Brown Drilling Co., prime contractors on the job for The Ohio Oil Co.

More than 200,000 lb of equipment was unloaded, starting with materials actually to be used for unloading the bigger elements of the drilling rig. The preliminary movement included cranes, trucks, wagons, water line, the prefabricated camp, storage and utility buildings in knock-down form, as well as food and bedding.

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Vokes mist-eliminators give the cleanest separation between liquid and vapour. Their scientific wire mesh construction gives an efficiency rating of over 99.9% with minimum pressure drop, thus increasing output, eliminating product loss and reducing contamination. Vokes mist-eliminators are also individually designed to suit the particular installation either as single elements or in "sandwich" form between specially constructed grids. Full details supplied on receipt of detailed enquiry.

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In August 1958 Cyanamid-Ketjen N.V. started production of platinum reforming catalysts. These fully regenerative platinum catalysts give outstanding performance in upgrading low octane gasolines to high value motorgasoline components in catalytic reforming units.

"X" Catalysts

Improvements of the above mentioned catalysts are the objective of our research efforts and are carried out in our well equipped laboratories and pilot plant facilities.

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NV CP

The sale of catalysts and other Ketjen products is being handled by
NEDERLANDSCH VERKOOPKANTOOR VOOR CHEMISCHE PRODUCTEN N.V.
63 Mauritskade, Amsterdam - Holland. P.O.B. 4038. Telephone 54322. Telex 12270. Telegrams: Chemicals

Grant Oil Tool Buys Cosasco

Grant Oil Tool Co. has purchased assets and inventories of Perfect Circle's Cosasco division which manufactures a line of patented access fittings which allow access to pressure vessels and lines without shutdown. The new acquisition will be known as Cosasco division of Grant Oil Tool Co.

Hydrojet Report

Dowell division of Dow Chemical Co., Tulsa, has published a technical report on "Hydrojet," a new abrasive jetting service for enlarging well base diameters and reconditioning producing formation falls.

Stewarts & Lloyds Appointment

Robert Mayhew has been appointed as United States sales representative for Stewarts & Lloyds, Ltd., London. He will maintain headquarters in New York City.

Perforating Guns Atlas Now Pan Geo Atlas Corp.

Stockholders of Perforating Guns Atlas Corp. (PGAC) of Houston, Texas have authorized a change of the company's corporate name to Pan Geo Atlas Corp. Paul Charrin, president of the company, said, "For a long time our former name was not appropriate for our business—due, primarily, to our many new oil field services developed over the years and our expansion to world-wide operations. Our firm has been popularly known as "PGAC" for many years throughout the Oil Industry; and this symbol of identification will continue because each word of our new corporate name carries the same first letter as formerly.

"Our new name, Pan Geo Atlas Corp., has a more applicable connotation. *Pan* (from the Greek: all) was chosen because it denote's PGAC's world-wide oil field operations. *Geo* (from the Greek: the earth) was chosen because it denotes PGAC's geological and geophysical applications in oil well completions. *Atlas* was continued from PGAC's original name when our company was founded in 1946."

Fracturing Services

Dowell division of Dow Chemical Co., Tulsa, has published a brochure describing "Fracturing Services for the Oil Industry." Copies are available on request.

Lane Wells Promotions

Kirby Gee, Jas. D. Hughes, and John Miner have been assigned new responsibilities in Lane-Wells Co., one of the Dresser Industries. Mr. Gee has become executive vice president, Mr. Hughes special assistant to the president and Mr. Miner has been appointed vice-president in charge of foreign sales exploitation.

SEG Promotions

Promotions for two men in Seismograph Service Corporation's subsidiaries have been announced. James E. Dorris, vice president of SSC of Venezuela, has been named vice president of SSC (International) with headquarters in Paris, France. Frank I. Garrette, formerly supervisor for SSC's continuous velocity logging opeations in Venezuela, has been named to succeed Dorris as manager of operations in Venezuela. In his new post at Paris, Mr. Dorris will be working closely with Compagnie Francaise de Prospection Sismique, SSC's French subsidiary.

Dresser Sells Monitor

Monitor internationally circulated oil and gas abstract magazine, by Dresser Industries, Inc., of Dallas has been sold to Petroleum Publishers, Inc., of Denver, Colo. The Denver firm is changing the name to World-Wide Oil & Gas Abstracts.

Dresser Sells Hydrocarbon Interest

Dresser Industries, Inc. has disposed of its interest in Hydrocarbon Research, Inc., which is a research engineering and contracting organization specializing in the design of various processes in the petroleum, natural gas, chemical, iron and steel industries.

Cummins International Appointment

The appointment of W. A. Reeks as managing director of Cummins Diesel International Ltd. has been announced by Reece Hatchitt, director of international operations of Cummins Engine Company, Inc., Columbus, Indiana. Mr. Reeks will be stationed at the company's international headquarters in Nassau, Bahama Islands. He will direct a Cummins staff of world trade specialists, including regional managers, sales and service representatives, market development and administrative personnel.

Head Hughes Tool Labs

G. R. King has been appointed laboratory director and J. C. Bonney as assistant laboratory director of Hughes Tool Co. Mr. King, who has been assistant laboratory director since November 1954, has specialized in mechanical testing methods since joining the Hughes research and engineering laboratory in 1937. Mr. Bonney, who has been with Hughes since 1942, has been engaged primarily, in the development of wear resistant materials and the processes for their application to rock bit cutting structures, bearings and component parts and to tool joints.

Halliburton Absorbs Otis

Otis Engineering Co. has become a subsidiary of Halliburton Oil Well Cementing Co. H. C. Otis, Otis' founder and chairman, has been elected a director of Halliburton.

This is our "Fifth-of-a-Century" of superior service to the oil industry. GEOLOGRAPH recorders give you the most complete record available while the well is drilling.

GEOLOGRAPH service is just as superior as the famous GEOLOGRAPH recorder! In all ways, it always pays to log as you drill with the GEOLOGRAPH recorder.

GEOLOGRAPH recorders combine exclusive, unique "Trip Action" and "Magna-Sensor" features.

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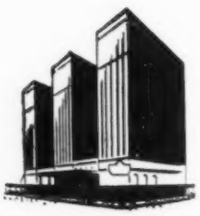
Here in the *new* Rice with its beautifully redecorated guest rooms, meeting quarters and restaurants are luxuries and comforts second to none. And here on the entire top floor is the fabulous Petroleum Club. Make the air-conditioned Rice *your* Houston headquarters. *Ideally located downtown.*

THE
RICE
HOTEL



Houston's Welcome to the World

J. J. Dunn

R. J. Evans, Jr.

Heads Johnston Export Sales

J. J. Dunn has been appointed manager of export sales for Johnston Testers, Inc. Mr. Dunn's oilfield experience dates back to 1947. He served in Venezuela before and after serving a year of active duty during the Korean War as a sergeant in the Marine Corps. He joined Johnston Testers in 1958.

Rife Heads Wilson Tools

John W. Rife has been appointed General Manager of Web Wilson Oil Tools, Inc. Mr. Rife joined Web Wilson fourteen years ago. In 1950 he became secretary treasurer. In 1954 he was elected to the board; and last year he was named assistant to the president.

Ray Buys McCollum Co.

Robert H. Ray Co. has announced the purchase of McCollum Exploration Co. A new firm, known as Robert H. Ray Co. Inc., will operate McCollum's Geograph, a weight dropping seismic instrument, in the United States, Canada, and Australia. Another company formed last November, McCollum Ray International Inc., will continue to operate the Geograph (also known as the "Thumper") in all other locations throughout the world.

Evans Advanced by BJ

R. J. Evans, Jr. has been named vice president and domestic sales manager of Byron Jackson Tools Inc. He has been associated with BJ oil-tool sales operations for more than 18 years.

UOP First Annual Report

Universal Oil Products Co., in its first annual report as a publicly owned company, had earnings in 1958, on a pro-forma basis and after USA and foreign income taxes, totaling $3,620,902, or to $1.25 per share of common. Actual earnings for the predecessor company were $5,754,902 which were adjusted on the pro-forma basis to give effect to changes resulting from the acquisition and merger of the old UOP into the present company.

Until February 11, 1959, UOP was owned by the Petroleum Research Fund, and the American Chemical Socy. was recipient of the net income from the trust for use in advanced scientific education and fundamental research in the petroleum field.

Kline At Blaw-Knox

George F. Kline has been named manager of the petroleum and petrochemicals department, chemical plants division of Blaw-Knox Co. He was formerly assistant manager of the department.

Lummus Appointments

The Lummus Co. has announced the election of C. Frank Corbin as comptroller, and Richard J. Hallinan as secretary. Mr. Corbin joined Lummus in 1955. He is a New York certified public accountant, and a member of the American Institute of Certified Public Accountants. Mr. Hallinan joined Lummus in 1958 as counsel after having been associated with the law firm of Shearman and Sterling and Wright. He is a member of the Association of The Bar of The City of New York.

Tire-Tanks For Oil

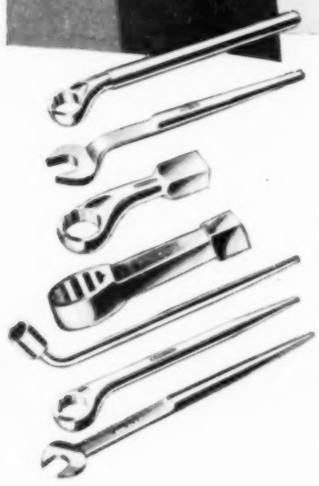
These oddly shaped tires—called "Rolli-Tankers" by the Goodyear Tire & Rubber Co.—serve two purposes. They can travel over virtually all types of terrain, transporting liquid inside them. The Rolli-Tankers, which are 64 inches high and 42 inches wide, comprise the major part of a rolling fluid transporter. Goodyear has been awarded an $800,000 contract to manufacture 166 of the transporters. Each tire carries 500 gallons, with a unit capacity of 1,000 gallons.

Joins Engelhard

Austin J. Hoffman has joined the gas equipment and chemical catalysts sales department of Engelhard Industries Inc.'s chemical division. His activity will be primarily in sales of catalysts, with his headquarters at 75 Austin Street, Newark, N. J. Previously, he was associated with the International Nickel Co. as an operations engineer.

Kellogg Appoints Cronkright

The M. W. Kellogg Co., New York, has announced appointment of Walter A. Cronkright as research chemist in the analytical group of Kellogg's Research and Development Laboratory at Jersey City, N. J.



Precision Hand Tools are of paramount importance to the Engineering Industry. King Dick hand tools are precision made under carefully controlled conditions, and set a superlative standard in quality and design.

From the largest Constructional Engineering Tools to the smallest B.A. Socket Set, King Dick inspection routines ensure the correct combination of selected steels, perfect balance and precision.

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* *Correction:* In the advertiser's index for August the agency for Security Engineering Division of Dresser Industries, Inc. was erroneously shown as being Persons-Beauchamp Advertising Inc. Security's agency is The McCarty Company of Texas, Inc., Dallas, Texas, which has handled the account for many years.

IN THESE COST-CONSCIOUS TIMES
MORE THAN EVER...

POWER PAYS OFF!

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With power tools, crews can work faster and can maintain a faster pace without fatigue.

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